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'Taiyo Maru 71' Demersal Trawling Cruise in Western Australian Coastal Waters South of 21° S, July-September, 1979

BY

D. I. HEALD
AND
M. H. WALKER

1982

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R E P O R T No. 51

'TAIYO MARU 71' DEMERSAL TRAWLING CRUISE, IN WESTERN AUSTRALIAN COASTAL WATERS SOUTH OF 21°S, JULY-SEPTEMBER, 1979.

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'TAIYO MARU 71' DEMERSAL TRAWLING CRUISE IN WESTERN AUSTRALIAN COASTAL WATERS SOUTH OF 21°S JULY - SEPTEMBER 1979

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ABSTRACT

A Japanese demersal trawler, 'Taiyo Maru 71' was given special permission to conduct exploratory trawling in the period 13.7.79-16.9.79 off the Western Australian coast between 21°S latitude and 35°30'S latitude, an area which partly overlapped the fishing grounds for the western rock lobster. The vessel was required to complete a catch, fishing effort and species composition log book issued by the Commonwealth Department of Primary Industry. Two Western Australian Department of Fisheries and Wildlife observers on board monitored fishing operations for the entire duration of the cruise and undertook research.

Details of each trawl conducted are given and discussed. Catch and effort data were summarized by 30 mile square fishing block. Best catch rates of 0.8-3.1 tonne per hour were taken in 3 general areas viz:

(1) Off the Exmouth/Shark Bay coasts from Pt Cloates to mid Shark Bay.

(2) Off the Geraldton coast from Edel land to north of the Houtman Abrolhos Islands and,

(3) South-west of Rottnest Island in deep water.

Analyses of variance showed that the effects of both area and daily rhythms of fishes made significant contributions to the total variation among catch rates. The most important species caught were lenko snapper, scads, striped sea pike, trevally and big-spined boarfish.

The amount of suitable trawling bottom was limited throughout the area, catch rates were generally low and variable and the area was assessed as having limited potential for demersal trawling. The low catch rates found are also interpreted in terms of the geology and primary production of the area.

I INTRODUCTION

Operations of foreign fishing trawlers engaged in feasibility fishing studies with Australian companies had been limited by government to north of latitude 21°S. Permission was given for 'Taiyo Maru 71' to undertake one demersal trawling cruise south from 21°S to 35°30'S for the purpose of investigating demersal trawling grounds, fish species present and the likely potential for trawling in this area (Figure 1).

Some previous trawling data for this area are available. they include the pioneering cruise of the sailing ketch 'Rip' which made 101 trawls in depths from 12-75 m between Shark Bay and Geographe Bay in 1904 (Gale 1905). The catches from this cruise included crabs, fish and a good showing of prawns which encouraged the subsequent development of a prawn trawl fishery in Shark Bay. The first Japanese research vessel to attempt to trawl along the W.A. coast was 'Umitaka Maru' which had 6 trawls in the north west in December 1963 and 8 trawls near Shark Bay in depths from 82-117 m. Catches of snapper, kingfish, Westralian jewfish, lizard fish and large quantities of sponge were recorded. In 1975, the Japanese stern trawler 'Kaiyo Maru' operated an experimental trawl net of 30 m headrope length for a total of 46 trawls. 9 trawls were conducted off Shark Bay (22°-27°S) and 37 trawls off the coast from Shark Bay to Cape Leeuwin (27°-34°S) in depths from 250 m-2500 m. 'Kaiyo Maru' identified 359 fish species for the west coast, Great Australian Bight and waters off Norfolk Island (unpublished Department Report).

In June 1978 the British United Trawler "Orsino", one of three vessels to fish in the Great Australian Bight under a Joint Fishing Arrangement conducted 9 exploratory trawls in depths of 36-183 m between 33°13'S and 34°46'S. 2.5 tonne of commercial fish was obtained including sharks, leatherjackets, knife jaw, John dory, queen snapper and nannygai. The vessel returned to the Bight because of the poor average catch rate of 0.14 tonne/hour and large quantity of sponge encountered.

Western Australia's most important export species - the western rock lobster, *Panulirus cygnus* George 1962 inhabits the area between 27°S and 34°S and is fished in depths down to 95 fathom. A fishery for pink snapper, *Chrysophrys unicolor*, Quoy and Gaimard, operates between 24°30'S and 26°30'S. To avoid any potential for conflict with these fisheries, limitations on trawling by 'Taiyo Maru 71' were set as follows (see Figure 2):

<u>Exmouth coast</u> (Area 1)

22°-24°S: to 12 nautical miles from the W.A. coast.

<u>Shark Bay coast</u> (Area 2)

24°-26°S: waters deeper than the 100 fathom (183 m) line.

Geraldton-Perth coast (Area 3)

26°-32°S: waters deeper than 100 fathom except for selected areas to 70 fathom (128 m) to be determined at the discretion of on board research staff/observers.

South West coast (Area 4)

32°-35°S: waters deeper than 12 nautical miles to longitude 115°10'E originally no farther east than this longitude in the Cape Leeuwin area. During the cruise, the southern limit was removed and the eastern limit was extended to 116°e to improve the likelihood of discovering trawlable bottom.

In addition, two Australian observers were required to undertake research and monitor the vessel's operations for the duration of the exploratory cruise. The cruise covers part of trip No. 3 (trawls A133-A191) and all of trip No. 4 (trawls 1-424) in the series of 5 test fishing cruises made by 'Taiyo Maru 71' whilst in Western Australian waters (Anon, 1980 and appendix 1). This report documents catch, fishing effort and commercial species, with particular regard to area of capture for every trawl made while observers were on board.

II METHODS

1. VESSEL

'Taiyo Maru 71' a 1475 tonne, 69 m stern trawler (Plates 1-3) was engaged for the cruise under charter from the Taiyo Fishing Co. Japan to Sumatil Australia Pty Ltd. Her main engine developed 2000 HP which gave a maximum cruising speed of 14.9 knots. Figure 3 shows an elevation plant of 'Taiyo Maru 71'. Trawling was usually done at 3-4 knots but decreased in deeper water. Bridge equipment included an NR702D Satellite Navigator which gave continuous positioning to ± 200 m, a 28-50 KHZ Furuno bottom sounder (Plate 4) with a range to 2000 m depth, and a Furuno nettsonde receiver which plotted headrope height above bottom and temperature as transmitted by accoustic signal from the drogue. Navigation backup was provided by two J.V.C.-Nivico radars of 50 and 98 nautical mile range respectively. Radio transeivers permitted V.H.F., H.F. and M.W. communications.

There were eight multiplate snap freezers each with a capacity of 3 tonne per day. Total theoretical frozen storage from the 3 fish holds was estimated to be 995 tonne, from volume/density calculations. Under continuous towing or steaming the average daily fuel consumption was 6.6. kilolitres. This gave a theoretical endurance of 72 days.

2. TRAWLING OPERATIONS AND PROCESSING OF THE CATCH

The following description of trawling operations and processing of the catch on board (2a-d) is largely drawn from a Departmental mimeo (Back, 1980).

(a) *Nets and rigging*

Five otter trawl nets, of slightly different constructional dimensions, rigging and mesh sizes, were interchanged during the cruise. The net in use was attached by heavy steel cable from the bridle junction, to two x 2.5 tonne dished steel otter boards which set vertically under tow (Figure 4). Differences in the rigging of bobbins on the ground rope and floats on the headrope were noted for the various nets. One of the combinations of headrope, groundrope and bridle used is shown in Figures 5 and 6. Basic net dimensions were as follows:

headrope length 43-50 m
groundrope length 57-64 m
vertical opening 5-6 m
wing and belly meshes 13.5-15 cm
codend mesh 10 cm, codend liner/sleeve 6.5 cm.

Figure 7 is a typical net design used during the cruise.

(b) *Shooting away*

Once suitable fishing ground had been located by echosounding and fish finding equipment, a course was set in preparation for shooting away the trawl net. Whilst the vessel was coming on to course, the cod end was tied off and winched out by the deck crew (Plate 5), then the net was shot away on the command of the duty officer on the bridge. Once the codend was drawn out from the rest of the net by power applied at the stern gantry the hook connected to a bite-off rope at the codend was flicked off manually, thereby releasing the codend down the stern ramp. The remainder of the net then ran out under its own weight until the bridle came taut to the otter boards. Deck crew then reconnected the trawl warps to the otter boards, which allowed the winch crew to pay out warps from the winch drums until the correct warp/-depth ratio was achieved. The exact warp to be payed out could be controlled by aligning markings on the warp with markings at 6 m intervals on the deck (Figure 8).

(c) *Hauling up*

Fifteen minutes before hauling commenced the vessel's public address system warned crews to get ready. Ten minutes later when a second warning was given, 2-3 men proceeded to the winch assembly, and 6 men took up their positions at the stern and on either side of the deck ramp. Upon a signal from the bridge, hauling up commenced. The winches were engaged together but could be operated independently if the recovery of one otter board was ahead of the other.

As the warps were hauled in at full trawl speed and the winch operators could not see the bridle and net bobbins until well after they had risen to the surface, the Chief Officer (in charge of deck operations) spoke to the winch operators via the ship's intercom, telling them to cease hauling at the appropriate time. Finally, as soon as each otter board came up against the stern gantry it was shackled to special anchoring attachments. The lazyline and trawl warps were connected by a single shackle at the otter board towing point, so when the lazyline was disconnected from the board, continued winching drew the head ropes, ground ropes and the front end of the net up the stern ramp and onto the deck ramp. A bite into the net was taken at that stage and the process was repeated and finally the codend was winched above the hatch cover (Plate 6) by a smaller winch, after an overhead line had been shackled to the winch line being used. Then the catch was emptied through the untied codend into the factory floor below. At this point any net mending or change which was required was quickly carried out before the net was shot away (Plate 7).

After the net was shot away again, the 8 deck crew went below to commence sorting the catch from the previous shot.

(d) *Factory operations*

A plan of the fish factory design is shown in Figure 9. As the contents spilled onto the factory floor the first stages of the factory operations began.

The sorting floor from which desirable fish species were collected was a corral design, enclosed by large wooden planks with removable pieces across the port and starboard trash shutes (Plate 8). The planks confined the catch and they remained in place if the catch was free of sponge, weed etc. or if most of the catch was to be saved. When only trash fish remained, one or both shutes would be opened and the waste quickly pushed out through the scuppers into the ocean. When a catch was mostly sponge, weed etc. the planks were removed so that the trash could be discarded as commercial fish were being sorted.

Unique implements were used to sort through the catch. These included a rake with a cross-bar handle which was used by one crewman, or if the men were in high spirits or had large quantities of trash to move then two or three men got behind it. Small gaff hooks were used to pick up the fish and two heavy grade rubber hoses (6 mm. thick x 64 mm. dia.) jetted water onto the floor in the direction of the trash shutes. As the sorting floor quickly flooded, fish separated from trash more easily especially when the ship rolled. Port and starboard shutes were then opened opportunistically to automatically void the trash. The large quantities of sponge encountered led the engineers to design two solid 6 mm. steel plate hoes. The men used these to chop large sponges into pieces so they would fit through the scuppers at the end of each shute.

All 7 to 8 men would work in the sorting area at one time, filling plastic baskets with fish when the catch was large (Plate 9). Small catches required four or less men to sort, leaving the other men free for deck work, maintenance and net mending.

Once sorting was completed, the plastic baskets of fish would either be placed in one of two washing machines (Plate 10), or be emptied onto a table for heading and gutting, depending on size and species. The two washing machines were accessible from the sorting area. The starboard machine (Plate 11) incorporated a tumbling action with piped water jetting along its length. The port washer was manual and started when a hose was inserted in one side.

A twin-blade saw was operated on the heading and gutting table. This had a slide shute between the blades which disposed of the heads into the port trash shute. The saw was always used by the same 2 men in each shift. Alongside them, stood 2 other men who gutted the headed fish and placed them in the port washer. Generally, all large species were placed on the table for heading whilst the smaller species were retained whole, and put through the starboard washer.

From the washers, the fish passed along conveyor belts which ran the length of the grading and panning tables. If a large catch of fish occurred, one species at a time was put through this process. The movement of fish along the conveyor belts was controlled by the packers, who had access to the stop/start button. They could also control the fish flow into each division by operating little gates which either allow fish travelling along the belt to pass their bay or be diverted into it.

One division was set aside for squid and cuttlefish on the starboard grading table (Plate 12). Here, a man would wash and tie their ink tubes to stop the mess otherwise produced when they were panned and frozen.

At the grading bays the men would pack the fish of equal size into pans (11 kg average net weight) and then place them on a centrally located conveyor belt. The pans travelled along the belt through the first salt water shower. Here the duty officer would record the number of pans of each species and their grade before passed into the snap freezer room (Plate 13).

Within the snap freezer room there were four freezer units, each having access through double doors on both sides. Each side had 12-14 shelves with space for one layer of pans by five pans across (Plate 14). Once stacked into the freezers, the shelving was hydraulically compressed to flatten the fish to the pan lip height.

The pans were removed after a minimum freezing period of 6 hours. Transported on a conveyor belt (Figure 9), the pans then passed through the second saltwater shower (Plate 15). This helped to release the fish block from the pan which slid back onto the

conveyor belt. The blocks next passed through the freshwater glazing machine ca. 2 m away (Plate 16) which increased the block weight by 0.3 kg. The block was then carried by conveyor belt into the boxing room (Plate 17). Blocks would be placed into plastic bags, two blocks to a box. The fish code and grade were stamped on the box, which was then bound and quickly shot down into the freezer hold.

3. RECORDS OF TRAWLING

The vessel was required to complete a Midwater and Bottom Trawling log, supplied by the Fisheries Division, Commonwealth Department of Primary Industry (Appendix 2). In addition, observers transcribed or calculated from the Ship's Master Log: trawl duration; course and ship's position according to fishing block and grid square; weather conditions including wind strength, barometer and air temperature; trawl catch; cumulative catch by day and catch rates. Fouled trawls and their possible cause were noted separately and because sounder paper was recycled, a sketch was made of the bottom over which nets were destroyed or damaged (see Table 1). All trawls over new ground were accurately plotted on a chart by ship's officers.

4. OBSERVATION AND SAMPLING OF CATCH

Observers scored fish species present in all trawls watched (68% of total) and noted dominance of commercial species and trash composition. Ship's officers used the logbook column 'rubbish discarded' to record the combined weight of sponge, coral, sand, jellyfish, seaweed, and elasmobranchs. To enable a useful assessment of the proportion of sponge in the total trash, observers made comments on the relative amounts of these trash components whenever possible, and the variety of sponge. The accuracy of this subjective estimate was directly related to the experience of the observer; records have not been used where independent observers could not agree on volume or where a catch was incompletely emptied into the fish factory sorting area. Careful selection of the data has enabled an assessment to be made of catches of sponge by depth and latitude.

Each catch was sampled biologically for commercially important teleost species. When time permitted elasmobranchs in the trash were sampled for species, lengths, weights, stomach contents and sexual maturity. The following teleost data were collected:- length frequency; individual lengths and weights; pan counts, weights and composition if species were mixed; scales and otoliths for age determination and gonad material for maturity determination and fecundity. Updated summaries of all biological sampling were maintained on board so that any gaps in the sampling might be rectified before the cruise was completed. The abbreviations T.L. and L.C.F. for measured fish refer to total length and length to caudal fork respectively. Identification of some fish was made on board, whilst others had common names assigned to them which were used exclusively thereafter.

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Verification of difficult species was undertaken in the laboratory after the cruise. Those few species which could not then be named with certainty were referred to taxonomists at the W.A. Museum.

5. FISHING STRATEGY

The daily fishing operation was usually planned at least 24 hours in advance by the Captain in consultation with observers and Bridge Officers No. 3 and No. 4. Area limitations described in the Introduction were respected. The specific placement of trawls was at the discretion of the Captain. However to avoid the concentration of fishing effort in a locality with favourable catch rates, which would reduce the exploratory nature of the cruise, it was suggested that the minimum radius between adjacent trawls be set at 2 nautical miles. Thus each statistical fishing block was covered thoroughly and the cruise proceeded according to schedule.

In the vicinity of Cape Leeuwin "hard' soundings i.e. indicating rough sea bed, regularly appeared on the sounder chart. In order to minimize the risk of gear loss and locate any bottom terrain favourable for trawling, the relevant block was saturated by echo sounding transects in a square spiral pattern during the night and a decision based on the results was made before first light as to its potential for trawling that day. When sounder traces of rough terrain appeared suddenly during a trawl, warps were often shortened to lift the net over such bottom. If however, a progressive deterioration of terrain occurred, the trawl was aborted. The warp/depth ratio was varied from $2\frac{1}{2}$:1 (up to 190 m) to 2:1 in deeper water (to 600 m).

6. DATA ANALYSIS

The data from the period in which observers were present on board the vessel has been stored on computer as the files TYOTRLDAT at Cycle 73 and TYOMRGDAT at Cycle 14. They contain:- a record of individual trawl numbers; dates; start and finish time for trawls; start and finish depths; blocks and sub-blocks using the Japanese numbering system; vessel speed in knots; bottom temperature in ^{o}C; trawls coded for net damage; trawl quantities in tonnes (total, rubbish and trash fish) and starting and finishing latitude and longitude. Computation of means, standard errors, variance and analyses of variance were done by a sub-programme; TYOTRLSPSS in the Fortran package "Statistical Programs for the Social Sciences". For the analysis of variance, a trawl was defined as a day trawl if most or all of it occurred between 0600-1759 hours and a night trawl if between 1800-0559 hours. Differences between means were tested using the program DIFMNS.F4 (method of Sokal and Rohlf, 1969 p 186).

III RESULTS

Logbook and observer collected data have been summarised in tables, figures, appendices and plates. Table 1 has comments on commercial species, juvenile commercial species when abundant,

trash composition and sounder trace sketches from ground which damaged trawls for all observed trawls. Table 2 lists trawl (shot) numbers assigned by observers, date, time, position and depth range, catch in 11 kg pans and catch rate (kg/hr). Hauls with catch rates regarded as economic are marked by asterisk. Table 3 summarises the catch by area, fishing effort and catch per unit of effort in half degree fishing blocks. Table 4 gives the quantity of each species or group saved from each trawl and the total catch of the species for the cruise. Table 5 documents the pan counts, weights and averages for some of the commercial species (Back, 1980).

Appendix 1 lists ports used and dates of blocks fished by 'Taiyo Maru 71' during her 5 fishing trips in W.A. waters, 1979. Appendix 2 is a page from the Midwater and Bottom Trawling log designed by the Commonwealth Department of Primary Industry for foreign fishing trawlers operating in the A.F.Z. Appendix 3 tabulates trawls of commercial potential by area and notes the dominant species. Appendix 4 shows analyses of variance performed on catch rate data. Appendix 5 lists the fish of commercial importance to the Japanese by family, species, common name used on board and the Japanese symbols used on graded boxes of fish. Appendix shows the common name assigned to species in observed trawls reconciled with those names used in the logbook.

The approximate cruise track taken by 'Taiyo Maru 71' within Western Australian waters (of the A.F.Z.) is shown in Figure 1. Figure 2 shows the block and sub-block system used by 'Taiyo Maru 71' related to latitude and longitude and the 200 m and 1000 m depth contours. Figure 3 is an elevation plan of 'Taiyo Maru 71'. Figure 4 gives details of the construction of the steel otter boards. Figure 5 shows details of one of the bridle arrangements used and Figures 6 and 7 show one way of rigging the ground rope and head rope and one of the 4 net designs used, respectively. Figure 8 shows how the warp setting could be fine tuned against marks on the deck ramp and Figure 9 is a plan of the fish factory layout.

Figure 10 shows a frequency polygon of the distribution of catch rates for the cruise. The diurnal periodicity of catch rates for trawls are graphed in Figure 11. The economic catch rate line (E.C.R.), is also shown. Figure 12 gives the mean catch per unit of effort, within 10 x 10 mile sub-blocks (9 per half degree fishing block). Figure 13 gives the size composition of random samples of six important species of fish before sorting. Figure 14 shows the relative proportion of species saved for processing. Figure 15 gives the relative mean proportions of fish saved, fish trashed and rubbish in each of the four fishing areas.

Plates 1,2 and 3, show 'Taiyo Maru 71' from various views (see also captions) Plate 4 shows the Furuno bottom sounder. Plate 5 shows the codend being pulled out by the stern gantry line prior to shooting away. In Plate 6 the codend is winched above fish

factory hatch to empty catch and in Plate 7 crewman carry out repairs and change the net. Some of the machinery and the layout of the fish factory have been shown in Plates 8 to 17. Plate 18 shows the main engine at the sub floor, level with tappets. Plates 19 to 24 show fish species of greatest importance to the Japanese on the cruise.

IV DISCUSSION

1. DETAILS OF TRAWLING

A comprehensive coverage of likely trawl ground between 22°S and 35°S was provided by 483 trawls (Tables 1 and 2). Comments on the catches of 2/3 of these trawls were made and species lists were also compiled. Overall, 93% of trawls were effective - these provided useful data. The 7% which were fouled have information on catch saved only. An analysis of effective trawls allocated 182 (41%) to the Geraldton-Perth coast, 103 (23%) to the south west coast, 90 (20%) to the Exmouth coast and 74 (16%) to the Shark Bay coast (Figures 1 and 2). Despite systematic echo sounding, the south west coast was responsible for the highest rate (14%) of fouled trawls. This area lay within the seaward continuation of the Leeuwin block - the bottom was extensively broken and granitic outcrops and pinnacles frequently impaired trawling. The least number of trawls (1%) was fouled off the Shark Bay coast. During the survey, the mean trawl depth was 202 m; most trawls were between 90-240 m but 5% were in less than 90 m (min. 41 m, block 826) or in greater than 440 m (max. 602 m, block 846).

Large catches of sponge frequently caused fouled trawls. Better catch rates of commercial fish nearly always occurred in the absence of large sponge catches. Sponge catches which exceeded 80% of the total catch weight for a trawl were most frequent off the south west coast in depths from 31-230 m. The converse was true for corresponding depth ranges off the Geraldton-Perth coast where sponge was most often less than 20% of the total trawl weight.

In the Exmouth coastal area sponge did not predominate in any particular proportion or depth category. There were insufficient trawls which caught sponge off the Shark Bay coast for an analysis. Below 290 m in any area, sponge ceased to become an important component of the catch and was usually absent in these deeper waters. Finger sponge species were dominant in depths below 200 m.

2. ANALYSIS OF CATCH RATES

To evaluate the catch rate data, a minimum economic catch rate of 0.81 tonnes/hour was calculated by the authors. This was required to pay operating costs and make a reasonable profit, which for a Japanese concern with this class of vessel was at least 12 tonnes per day (Mr K. Kaino, pers comm., 1980) at an assumed average wholesale landed value of $1000 per tonne. Smaller classes of vessel with fewer crew could probably

have operated economically at lower daily catch rates, but would have been heavily dependent on marketing strategy, fuel costs and catch values, and the possibility of using every available component of the catch viz. shark for fillets and selected trash fish for fish meal, bait or secondary products.

Catches of saved teleost fish species were poor, with a mean catch rate of 0.22 tonne per hour (std. dev. = 0.31) (Table 2 and Figure 11). The mean catch rates have been related to area in Table 3. The highest mean catch rate was obtained off the Shark Bay coast, 0.28 tonne per hour; followed by the Exmouth coast 0.23 tonne per hour; the Geraldton-Perth coast 0.19 tonne per hour and the south west coast, 0.10 tonne per hour. When the catch rates were plotted for individual trawls, they revealed a regular daily rhythm in which the best catch rates occurred in daylight hours with an amplitude which was dependent on factors such as area and species composition (Table 4, Figures 11 and 12).

There were 16 trawls which exceeded the minimum economic catch rate defined previously (Appendix 3). These had a mean catch rate of 1.27 tonne per hour and differed most often from non-commercial trawls by the presence of one or two saved species which were dominant in the catch. In more than 1/3 of these trawls, the dominant species was pelagic in habit. The low catch rates experienced throughout the cruise were attributed to a lack of suitable edible fish rather than any obvious deficiency in the trawling ability of 'Taiyo Maru 71'. The nets appeared to fish very well and except for the occasional long turnaround times after foul hauls, no improvement in the fishing techniques of this vessel could have been made. The trawl net was on the bottom fishing for an average of 14.9 hours per day (S.E. = ± 0.6) excluding days on which foul hauls occurred. The average trawl duration was 2 hours (std. dev. = 3.6).

3. THE COMMERCIAL FISH SPECIES

Commercial fish species saved by 'Taiyo Maru 71' were predominantly teleosts. Of the 38 discrete species or groups listed in Table 4, only 2 (5%) were planktivorous. The remainder could be divided into omnivorous (39%), lower carnivores (37%) and higher carnivores (19%). The saved fish species have been classified into 4 categories of importance, according to total catch of each for the cruise.

A. *Major species* - total catch exceeded 8 tonne, sometimes most abundant species present in catch.

B. *Lesser species* - total catch between 2 and 7 tonne, all individuals saved irrespective of size.

C. *Minor species* - total catch in range 0.3-1.6 tonne, usually saved when encountered.

D. *Insignificant species* - total catch less than 0.3 tonne; rarely more than a few pans caught in any trawl, but prized by Japanese palates for their high market value or excellent eating quality.

Appendix 5 lists commercial fish species by family, scientific, common and the Japanese Katekana/Kanji names. Table 5 gives the average pan counts and weights for various fish of commercial importance discussed below. Approximate totals of 350 species of teleosts and 90 species of elasmobranchs were found on the cruise from the areas trawled.

A. MAJOR SPECIES

Lenko snapper (*Taius tumifrons*), 57.3 tonne. Plate 19. Caught between 21°18'S and 28°36'S in depths from 120-330 m. The best catches were taken on trawls A180, A183 and A179 (Table 4). In trawls prior to July 25th, the larger sizes in the range viz. 12-28 cm total length were saved. Later, on instructions from Japan, only the largest fish (greater than 16 cm) were retained (ca. 8% of lenko catch for any trawl). Towards the end of the cruise, to reduce wasted space due to whole packing in pans, the crew produced butterfly fillets from medium sized lenko for close packing (Figure 13a). These instructions from Taiyo Fishing Co. in Japan had the effect of deterring 'Taiyo Maru 71' from further fishing directed primarily at lenko snapper as a target species. Lenko is demersal in habit and a higher carnivore.

The Scad group (*Fam. Carangidae*), 21.8 tonne.

Catches of scad were not differentiated by species in the logbook. On several occasions, the two very similar species Jack mackerel and yellowtail scad occurred together in a trawl catch. Catches of the similar round scad and layang scad were also taken simultaneously. When 2 or more species of scad occurred together, they were often readily distinguished due to differences in size class. The 3 best catches were trawls 381, 380 and 224 (Table 4).

Yellowtail scad (*Trachurus mccullochi*) Plate 20. This species was identified 72 times out of 156 occurrences of the scad group in the species list. It was also the dominant scad present in and saved from catches and is estimated to have comprised 78% by weight of the total scad catch from trawls sampled. It was present in catches between 23°32'S-33°09'S, and in depths from 43-230 m. Compared with other scads, yellowtail scad were usually of small to medium size (15-30 cm L.C.F., Figure 13b) and were inevitably packed whole in trays, sorted in up to 6 size grades, as the entire size range caught was retained. The size classes caught were predominantly juvenile or immature. Scad of this size are much sought after by the Japanese market. This species is pelagic and planktivorous in habit.

Round scad (*Decapterus maruadsi*). This species was identified 42 times out of 156 occurrences of the scad group. It made up an estimated 8%-12% of the total saved scad catch by weight, based on sampling. It occurred between 22°53'S and 30°18'S in depths from 80-279 m. Round scad caught were in the size range (20-34 cm L.C.F.) and being medium to large sized fish, were often headed and gutted before being packed into trays. Whenever the species occurred together with yellowtail scad, the round scad were mostly headed and gutted and the yellowtail scad were packed whole. For this reason, logbook records of dressed yellowtail scad were assumed to be mainly round scad.

Those size classes caught appeared to be predominantly mature. The species is planktivorous and pelagic in habit.

Jack mackerel (*Trachurus declivis*). Jack mackerel was positively identified 22 out of 156 occasions on which scad species were present in trawls. No large catches or catch rates of this species were encountered. Jack mackerel was present in small numbers in catches between 31°50'S - 34°46'S over depths of 102-408 m. Fish caught were in the size range (13-37 cm). On one occasion adult fish in running ripe condition were caught (trawl 338). Jack mackerel were packed either in the whole or dressed condition according to size caught. The species is planktivorous and pelagic in habit.

Layang scad (*Decapterus macrosoma*). There were 20 occasions on which this species was positively identified out of 156 times in which one or more species of scad were present in catches. The species was caught in the latitudes 22°53'S-31°57'S, in depths from 87-160 m. Layang scad were often caught with yellowtail scad, sometimes with round scad, and three times also with Jack mackerel. Layang scad were of medium to large size (20-33 cm L.C.F.) when compared with the size classes of yellowtail scad and they were usually packed in dressed condition (Figure 13c). This species is planktivorous and pelagic in habit.

Striped sea pike (*Sphraena obtusata*), 16.7 tonne. Striped sea pike were caught between 21°32'S-28°13'S in depths from 105-250 m. The best catches were in trawls 10, 22 and 102 just north of the Houtman Abrolhos Islands (Table 4). The size range caught (23-40 cm L.C.F.) which consisted of a mixture of immature fish and adults, was retained and packed whole (Figure 13d). It has a high market acceptance by the Japanese. The species is a pelagic lower carnivore.

Trevally and cavalla

Trevally (*Pseudocaranx spp.*), 10.9 tonnes est. Plate 22.Trevally were caught between 22°53'S- 35°04'S in depths from 87-269 m. The 3 best trawls were A147, A148 and A149 (Table 4). Whenever trevally were sufficiently abundant in a catch to warrant retention, they were saved whole (20-25 cm L.C.F.) or dressed (26-50 cm L.C.F.) (Figure 13e). The species are pelagic carnivores.

White-finned cavalla (*Carangoides equula*), 0.5 tonne. est. This species was recorded between 23°34'S and 28°16'S in depths from 80-302 m. Although often present in catches it was only saved when in worthwhile numbers. In the size range caught (14-26 cm L.C.F.) the species was usually saved whole, chosen from larger sized fish. Both trevally genera are readily marketable in Japan. White-finned cavalla are pelagic lower carnivores. The best catch was taken in trawl 148 (Table 4).

Big spined boarfish (*Undecimus hendecacanthus*), 8.9 tonne. Plate 23. This species was recorded between 23°20'S and 34°55'S in depths from 298-602 m. Commercial catches however, were restricted to deeper waters in the southern halves of the Geraldton-Perth coast and south west coast. The 3 best catches were in trawls 348, 280 and 331 in which it was the dominant species (Table 4). The entire size range caught (20-40 cm T.L.) was saved (Figure 13f). It was a popular table fish with the crew and presumably had good marketing potential in Japan. From this cruise, the species became a new scientific record for Australia.

B. LESSER SPECIES

Sweetlip emperor (*Lethrinus chrysostomus* and *L. nebulosus*), combined total catch 6.7 tonne (Plate 24). These 2 species were caught between 22°49'S-26°57'S latitude in depths from 65-202 m. *L. chrysostomus* was the dominant species in catches (91%). Sea bream (*Gymnocranius robinsoni*) was sometimes saved and mixed in with *L. chrysostomus*, probably constituting up to 3% by weight in mixed pans. Yellow sweetlip emperor(*L. nebulosus*), which was either packed separately or mixed in with *L. chrysostomus* comprised about 6% of the total catch of this group. All these species were always dressed for packing and ranged in size from 26-46 cm L.C.F. No small fish were discarded as all species have good acceptance in Japan. They are demersal, lower carnivores.

Goatfish (various genera), 5.6 tonne.
About 7 species of goatfish were caught by 'Taiyo Maru 71'. These included the 'sunrise goatfish' (*Parupeneus sp.*), 'lemon stripe goatfish' (*Upeneus moluccensis*), black-saddle goatfish (*Parupeneus fraterculus*) and red mullet (*Upeneichthys lineatus*). The dominant species - 'sunrise goatfish' (ca. 72% of the saved goatfish catch) was taken between 21°32'S-31°42'S in depths from 65-234 m. Because of their tendency to spoil quickly after being headed, they were always saved in whole condition. The saved size range for the group was 18-37 cm T.L.. Except for red mullet which were mainly discarded as juveniles, other species of goatfish were saved regardless of size when they were encountered in sortable quantities. All species are demersal lower carnivores.

Cuttlefish (at least 2 species), 5.6 tonne. These species were encountered in small quantities throughout the area covered. They have a good marketability and fetch a high price so were always saved, whole. The 3 best trawls were A149, 143 and 225 off Pt Maud and Edel Land (Table 4 and Figure 2). They are pelagic carnivorous molluscs, sub-order Sepioidea.

Pink snapper (*Chrysophrys unicolor*), 5.5 tonne. Whenever encountered, the entire size range caught (23-60 cm L.C.F.) was retained. They were most common in the northern part of the Geraldton-Perth coast, the species was saved between 23°-34°51'S in depths from 46-280 m.

Miscellaneous lutjanids 4.1 tonne. This group was comprised of chinaman fish (*Symphorus nematophorus*), fleshy lipped snapper (*Lipocheilus carnolabrum*), sharp toothed snappers (*Pristipomoides filamentosous* and *P. typus*), scarlet sea perch (*Lutjanus malabricus*) and yellow-line fusiform snapper (*P. multidens*). These species were caught mostly off the Shark Bay coast and were always saved.

Nannygai and alfonsin (*Centroberyx affinis* and *Beryx splendens*), 3.9 tonne. Always saved when caught. Nannygai were found between 24°15'S-35°07'S in depths from 84-382 m whilst alfonsin were only caught in deeper water, 398-602 m between 23°13'-34°48'S. Both species were always headed and gutted. In this berycoid group swallowtail (*Trachichthodes lineatus*), because of their small size were always trashed, whilst Bight redfish (*Trachichthodes gerrardi*) were saved only twice and therefore were not commercially important to the Japanese.

Red bigeye *Pricanthus macracanthus*
Threadfin bigeye (*Cookeolus boops*) } 3.4 tonne, always saved.

Veilfin (*Metavelifer multiradiatus*) 2.6 tonne, rarely saved.

Pearl perch (*Glaucosoma burgeri*) 2.6 tonne, Westralian jewfish (*G. hebraicum*) always saved.

John dory (*Zeus faber*)
Mirror dory (*Zenopsis nebulosus*)
McCulloch's dory (*Cyttoidops mccullochi*) } 2.1 tonne, always saved

"Captain's fish" (*Anthias spp.*), 2.1 tonne, always saved.

Gulf gurnard perch (*Neosebastes panticus*) 2.0 tonne, always saved.

The relative proportions of species in the total catch, discussed in categories A and B as above are shown in Figure 14.

C. MINOR SPECIES

Red emperor (*Lutjanus sebae*) 1.6 tonne, always saved.

False snapper (*Argyrops spinifer*), 1.6 tonne, always saved.

Lizard fish (*Saurida undosquamis*), 1.1 tonne, saved exclusively for 'sourimi' (fish paste) production on board at start of trip, for trial use in 'kamaboko' (fish cake) manufacture.

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Emperor (*Lethrinus choerorynchus*) 1.1 tonne, always saved.

Orange arrow squid (*Todaropsis eblanae*), 1.1 tonne always saved, had a high market value.

Rock cod, slimy cod (*Epinephelus spp.*) 0.7 tonne, always headed and gutted if small (less than 4 kg), filleted if large.

Amberjack (*Seriola dumerili*) 0.7 tonne, always saved
Black-banded kingfish, (*Seriolina nigrofasciata*) occasionally saved.

Ghost fish (*Hydrolagus ogilbyi*) 0.6 tonne, usually saved, smaller specimens sometimes rejected.

Deepwater flathead (*Platycephalus longispinus*) 0.6 tonne,
Sand flathead (*Neoplatycephalus speculator*) always saved.

Gummy shark (*Mustelus antarcticus*) - rarely saved
Piked dogfish (*Squalus megalops*) - some saved at start and end of trip.
Bignose shark (*Carcharhinus altimus*) some juveniles saved at start of trip. Combined shark catch 0.6 tonne.

Roundfin squid (*Sepioteuthis australis*) 0.5 tonne, always saved because of its high market value.

Latchet (*Pterygotrigla polyommata*) - always saved.
Red gurnard (*Chelidonichthys kumu*) - usually saved.

Queen snapper (*Nemadacylus valenciennesi*) 0.3 tonne, saved after consultation with observers.

Mulloway (*Argyrosomus hololepidotus*) 0.3 tonne, saved filleted.

D. INSIGNIFICANT SPECIES

These included; barracouta/hake (=gemfish) (*Leionura atun*) and *Rexea solandri*), slate bream (*Plectorhynchus pictus*), maroon arrow squid, Australian hairtail, (*Trichiurus coxii*) tailor, (*Pomatomus saltator*), blue mackerel (*Scomber australasicus*) and dusky morwong (*Dactylophora nigricans*). These species were encountered in small quantities only in comparison with fish in categories B and C. Appendix 6 also lists additional species which were present as traces (a few individuals per trawl) but saved in mixed pans because of their high acceptance by the Japanese. It was possible to calculate average weight for species from the series of pan counts made during the cruise. These are shown for some commercial species in Table 5.

4. TRASH FISH

Trash fish made up 40-50% of the total fish biomass.

A variable part of the trash fish included sub-size and juveniles of commercial species. An area comparison of the relative proportions of fish saved, trash fish and rubbish discarded is given in Figure 15.

Three species groups which were either under-utilized or not saved at all from the trash included sharks particularly gummy shark of which up to 2.0 tonne per trawl was caught off the Geraldton-Perth coast, leatherjackets - the species chinaman leatherjacket would have been saved by a British or Australian trawler, and lizard fish, used by Japanese on a trial basis in sourimi (fish paste). A Taiwanese operation would have saved much of the shark caught. Many species among the trash fish would also have been ideal as bait for rock lobsters, crabs or longlines or for use in fish meal, especially those in the 6-20 cm size range.

V CONCLUSIONS

1. PHYSIOGRAPHY

There are several features of the physiography of the southern W.A. coastal zone which have an important bearing on the extent of the grounds which are suitable for demersal fish trawling. Foremost amongst these is that the continental shelf (boundary at 2000 m) is only about 150 miles wide at its maximum off Shark Bay (25°S) but more importantly is very much narrower for most of its length (less than 15 miles in width off Exmouth Gulf, 22°S) and it also becomes very narrow near Lancelin (31°S). Secondly, within the coastal shelf zone south of 22°S, the surface waters are quite deficient in dissolved nutrients such as phosphates and nitrates (Kirkwood 1967 in Phillips, Morgan and Austin 1980; Rochford 1967) and low in zooplankton (Tranter, 1962). Thirdly, the existence of an extensive complex of limestone/aeoleonite and eroded dune sandstone reef chains offshore and onshore between Busselton and Murchison River occupy a considerable area which would otherwise have been more suitable for demersal fish trawling. An important geological feature of the south west coastal region is the Leeuwin block which extends into the Naturaliste Plateau (Figure 1) and is associated with chasms, pinnacles, reefy outcrops and rough bottom generally. In the event, the considerable period of time spent exploring by echo sounder in this vicinity yielded little suitable trawl ground. From these known features and perhaps on an intuitive basis, it might have been expected that the establishment of a demersal trawl fishery would have been difficult due to the limited suitable trawl ground and low plankton values in southern W.A. coastal waters. These factors would have been unlikely to produce a demersal or pelagic fish resource of any magnitude.

2. CATCH RATES

The catch rates obtained by'Taiyo Maru 71' were discouraging from several points of view. Firstly only 16 trawls out of 483 exceeded the determined minimum economic catch rate (Appendix 3). Secondly, within the areas surveyed, mostly low catch rates and trawls fouled by rough ground or excessive sponge catches would appear to preclude much of the area from future trawl fishery development. The low average catch rate experienced throughout this exploratory cruise did not appear to reflect on

the trawling ability of 'Taiyo Maru 71'. In fact the low catch rates obtained on the west coast by 'Taiyo Maru 71' confirmed what had been indicated in previous exploratory trawling by 'Umitaka Maru' in 1963, 'Kaiyo Maru' in 1975 and 'Orsino' in 1978.

Nevertheless, the catch rates obtained during this cruise are not strictly comparable with those expected from a purely commercial fishing situation. The vessel was instructed to remain in an area of commercial catch rates for no longer than was necessary to thoroughly cover the ground and particular target resource which therefore did not permit maximisation of the potential catch. To properly evaluate the magnitude of the demersal resources located, e.g. Lenko snapper off Shark Bay or big-spined boarfish off the south west coast, further test fishing may be warranted. When the catch rates were subjected to an analysis of variance, a considerable amount of variation in the data could not be readily explained even after effects of area and day or night trawling or their interaction had been taken into account. Depth had no effect on the variation in overall catch rates but had a highly significant effect on the catch rates of some species, e.g. big-spined boarfish and lenko snapper. The large residual variation found suggested either that one or more other factors may not have been taken into account for the analyses or that the assumption of homogeneity of error variance was incorrect for this data set. It is very likely to have been the result of both causes. Other possible sources of variation not tested included the effects of species biomass, composition or ratios in the saved catch, the effect of sponges, which the Japanese believe depress the catch expectation of an area (Anon, 1980), water temperature, trawl speed and the influence of chance catches of pelagic species such as scads which ranked high among species saved.

3. MAJOR SPECIES

Separate analyses were undertaken for lenko snapper, scads, striped sea pike, trevally and big-spined boarfish. For lenko snapper, the best results were from sub-blocks 931.2, 931.3, 935.6 and 941.4 (Figure 12) where the catch rate of this species often exceeded 0.5 tonne per hour. Catch rates of lenko snapper plotted by depth for all areas combined but separately for day and night trawls showed that day catch rates were significantly higher than night catch rates and they were more variable. The best catch rates off the Shark Bay coast were in depths from 240-290 m. A relatively small proportion (greater than 16 cm L.C.F.) from the total size range caught was acceptable to the Japanese as whole frozen fish, however on a few occasions, the middle sizes (12-16 cm L.C.F.) were retained for filleting.

In the scad group which was mainly dominated by yellowtail scad, catches exceeded 0.3 tonne per hour on 12 trawls. Catch rates ranged from 0.3 to 2.7 tonne per hour in this group

and the best catch rates occurred in sub-blocks 919.3, 954.3, 964.1, 964.2, 970.8, 975.4 and in the group of sub-blocks about 35 miles west of Cape Bouvard viz: 826.9, 825.1, 825.2, 825.6 (Figure 12). Day catch rates were significantly higher than night catch rates and had greater variability. The best catch rates in the day were over a depth of 225 m. In future the use of a large pelagic net may improve catch rates of scad.

Catch rates of striped sea pike above 0.3 tonne per hour occurred only in sub-blocks 964.4, 970.6 and 975.4 (adjacent) and in the 3 sub-blocks about 35 miles west of Cape Bouvard viz. 825.1, 825.2 and 825.6 (Figure 12). Mean catch rates at depth were slightly greater by day than by night and were best at about 225 m.

Trevally catch rates exceeded 0.3 tonne per hour on 3 occasions only (range 0.3-0.6 tonne per hour), in sub-blocks 928.7 and 928.9 (Figure 12). These were taken in daylight hours at 135 m depth.

Using suitable fishing methods, a reasonable resource of the big-spined boarfish (catch rate exceeded 0.4 tonne/hour) may be capable of exploitation. The four good catch rates were taken exclusively in deep water (ca. 400- 500 m; mean 425 m) and ranged from 0.5 to 0.8 tonne per hour in sub-blocks 820.3 (the best) and across the Naturaliste Plateau sub-blocks 838.1, 838.3 and 846.7 (Figure 12). Good catch rates of this species were severely limited by the general lack of suitable trawling grounds off the south west coast and by the presumed small area occupied by commercial densities of this stock. Day catch rates were higher than those at night.

The 14 species or groups which predominated in the total saved catch of 178 tonne shown in Figure 14. Ranked in importance by weight they included lenko snapper (32%), scads (12%), sea pike (10%), trevally (7%), deepwater boarfish (5%), sweetlip emperor, goatfish, cuttlefish, pink snapper, chinaman fish, nannygai, bigeye, veilfin and pearl perch. Catches of the remaining species were regarded as minor or insignificant and comprised 11% of the saved catch by weight. Off the coast between Exmouth and Perth (areas 1-3) fish saved comprised an estimated 60% of all fish caught by weight but were only 50% by weight off the South West coast. The demersal trawling operation, although it gave reasonable catch rates of pelagic species such as scad, did not provide a true indication of the magnitude of the total pelagic source in the areas examined.

Future demersal trawling or at least selective exploitation of some of the species caught may be feasible for a smaller class of vessel with fewer crew. Future operators should, however, bear in mind the previous trawling history of these areas viz. generally low catch rates, limited suitable trawling bottom and the great variability in results possibly due to seasonal changes in fish behaviour, catchability and location.

VI ACKNOWLEDGEMENTS

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Table 1 Comments on commercial species, their juveniles, echo sounder trace sketches and trash composition for all observed trawls.

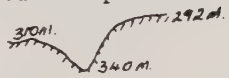
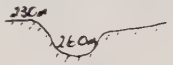
Shot No.	Total Catch	Comments
1	6-8 tonne	Catch dominated by sponge.
2	2 tonne	Catch mainly rock and sponge. Wide size range black banded cod. Net damage.
6	3.0 tonne	No sponge, striped sea pike dominant.
7	2.0 tonne	No sponge, striped sea pike dominant, some yellowtail scad.
8	1.5 tonne	No sponge, striped sea pike dominant, some nannygai.
9	1.5 tonne	Catch dominated by striped sea pike, very little sponge. Net damage.
10	2.5 tonne	Larger catch, dominated by striped sea pike, very little sponge, some gummy sharks.
11	0.5 tonne	Small catch, gummy shark dominant, nursery for nannygai.
12	0.5 tonne	Catch ½ sponge, ½ fish.
13	0.5 tonne	Catch ½ sponge, ½ fish.
14	0.5 tonne	All sponge, damaged net.
15	2 tonne	Catch 3/4 fish yellowtail scad dominant, striped sea pike also significant, wide size range of scad.
16	2 tonne	Lenko snapper dominant, striped sea pike 2nd.
17	3 tonne	Catch mostly fish, little sponge, striped sea pike dominant, yellowtail and northern scad 2nd.
18	2-3 tonne	Catch mostly fish, scads dominant, striped sea pike 2nd. Juvenile red gurnard present.
19	0.2 tonne	Little commercial catch, blue lantern fish dominant. Rough ground. 
20	0.3-0.4 tonne	Sponge dominant, lenko snapper dominant fish, nannygai 2nd. A lot of sand.
21	0.3-0.4 tonne	Catch equal quantities of jellyfish, sponge and fish, round fin squid dominant.
22	2 tonne	Striped sea pike dominant, a few sponges.
23	1 tonne	Striped sea pike dominant, a few sponges, over a canyon. 
24	1.5 tonne	Striped sea pike dominant, scads 2nd.
25	3 tonne	Mainly fish, some sponge, striped sea pike dominant, nannygai 2nd.
26	0.3-0.4 tonne	½ fish, ½ sponge. Veilfin dominant commercial species, stripeys dominant trash species.
27	0.3-0.4 tonne	Mainly sponge. Juvenile sunrise goatfish and threadfin bullseye present.
28	1 tonne	Mainly sponge. Veilfin dominant commercial species, stripeys dominant trash species.
29	—	Damaged starboard wing of net.
31	2 tonne	Nannygai dominant. Trashed 1 tonne of fish including small lenko, veilfin, nannygai and scad.
32	3-4 tonne	Striped sea pike dominant, veilfin 2nd, very little sponge.
33	—	Rough bottom, broke net head and footrope.
34	5-6 tonne	Mainly sponge, very few fish but nannygai dominant.
35	4 tonne	Mainly sponge, very few fish.
36	3-4 tonne	Mainly sponge, some kelp, not much fish.
37	3-4 tonne	Mainly sponge, which caused commercial fish usually saved to be trashed.

Table 1 (continued)

Shot No.	Total Catch	Comments
38	0.5 tonne	Mainly sponge, veilfin dominant.
39	—	Rough canyon bottom demolished trawl.
40	—	Rough canyon bottom demolished trawl.
41	2 tonne	2/3 sponge, 1/3 elasmobranchs and trash teleosts.
42	8-10 tonne	Mainly sponge, fish dominated by trash species, veilfin dominant commercial species.
44	1 tonne	Mainly finger sponge. Rough canyon bottom. Juvenile nannygai abundant, trash species dominated by piked dogsharks and lantern fish.
45	3-4 tonne	Sponge, very few fish.
46	0.4 tonne	Little sponge, few nannygai, big sharks present.
47	0.4 tonne	No sponges, fish indicative of deeper water shot, cucumber fish dominant, mirror dory 2nd.
48	1.5 tonne	½ sponge, ½ fish mostly trash species, red mullet dominant commercial species.
49	1-1.5 tonne	½ sponge, large whaler sharks present.
50	—	Rough, hard bottom, broke net headrope.
51	2-3 tonne	1 tonne flat sponge, some weed, yellowtail scad dominant commercial, large chinaman leatherjackets dominant trash.
52	2 tonne	2/3 finger and ball sponge, 1/3 fish mostly trash species, a few gulf gurnard perch.
53	3 tonne	½ sponge, ½ fish, scad dominant fish species.
54	2 tonne	1/6 flat sponge, 5/6 fish, scads dominant fish species.
55	3-4 tonne	½ ball sponge. ½ fish and elasmobranchs, scads dominant, gulf gurnard perch 2nd.
56	1-1.5 tonne	Some large ball sponge, scads dominant fish species.
57	1-1.5 tonne	Some large sponge, Jack mackerel in spawning condition dominant, red mullet dominant trash fish.
58	7-9 tonne	Mainly sponge, few fish.
60	8-9 tonne	Mainly sponge, few fish.
61	0.5 tonne	½ ball sponge, ½ fish, some rocks.
62	3-4 tonne	Mainly finger sponge, few fish.
63	4-5 tonne	Rough bottom, net swum over it. Sponge/fish mixture, ruby fish dominant.
64	0.7 tonne	Mainly finger sponge, flathead dominant commercial species.
65	0.5 tonne	Mainly fish, few flathead, dominant trash species blue lantern fish, piked dogfish 2nd.
66	3-4 tonne	Mainly finger and ball sponge, very few fish.
67	2 tonne	Mainly flat sponge, 1/20 fish.
68	6-7 tonne	Mainly flat sponge, Bight red fish and swallowtail equally abundant.
69	2-3 tonne	Mainly sponge, some plate coral.
70	2-3 tonne	Mainly sponge, very few fish.
72	-	Rough bottom, damaged net.
73	0.2 tonne	Mainly fish, a variety of commercial species, none dominant.
74	0.3 tonne	1/3 sponge, 2/3 fish, gulf gurnard perch dominant.

Table 1 (continued)

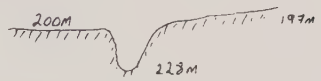
Shot No.	Total Catch	Comments
75	1-1.5 tonne	½ sponge, ½ fish, gulf gurnard perch dominant commercial species, ruby fish dominant in trash.
76	7-8 tonne	Mainly large flat and cup sponges, few silver trevally, dominant species.
77	7-8 tonne	Mainly sponge, all varieties, hydroids present. No commercial catch.
78	2-3 tonne	Mainly sponge, some kelp, very few fish, 3 rock lobsters caught, discarded alive.
79	5-6 tonne	Mainly large ball sponge and kelp, Jack mackerel dominant fish but all species trashed.
80	5-6 tonne	Mainly sponge, few gulf gurnard perch, Jack mackerel and yellowtail scad.
83	0.5 tonne	½ sponge, ½ fish, yellowtail scad dominant.
84	0.5 tonne	½ sponge, ½ fish, yellowtail scad dominant commercial, red mullet dominant trash species.
85	0.4 tonne	Mainly fish, latchet dominant commercial, piked dogfish dominant in the trash.
86	2 tonne	3/4 finger sponge and kelp, scad dominant commercial, thickskin sharks dominant in trash.
87	2-3 tonne	½ sponge, ½ fish, small commercial content.
88	2-3 tonne	Mainly fish, 1/10 sponge and kelp, veilfin dominant.
89	0.3-0.4 tonne	Sponge 1/3, remainder mainly trash fish, few commercial species.
91	4-5 tonne	Mainly sponge, few commercial fish, a rock lobster batten pot, broken up in catch.
92	4-5 tonne	Mainly large sponge, rough ground, no net damage. 
93	2-3 tonne	Mainly sponge, few commercial fish, rock lobster batten pot fragments and a bait pouch.
95	3-4 tonne	Mainly sponge, some rock, few commercial fish, some rock lobster pot rope.
96	4-5 tonne	Mainly sponge, some kelp, very few fish of commercial importance.
97	4-5 tonne	Mainly finger and ball sponge, cuttlefish dominant (few).
98	0.3 tonne	Mainly fish, a little sponge and kelp, veilfin dominant.
99	0.3 tonne	Mainly fish, very little sponge, nannygai dominant.
100	0.4 tonne	Mainly fish, nannygai dominant, 4 gallon paint drum in trash.
101	1.5-2 tonne	½ sponge, striped sea pike dominant, nannygai second.
102	2-3 tonne	Mainly fish, striped sea pike dominant, lenko snapper 2nd.
103	2-3 tonne	Mainly fish, lenko snapper dominant.
104	2 tonne	1/6 sponge, lenko snapper dominant, sunrise goatfish 2nd.
105	0.3 tonne	Mainly fish, lenko snapper dominant, some big sponges.
106	0.2 tonne	No sponge, lenko snapper dominant, 80 kg large asteroid echinoderms.
107	2 tonne	Fish and sponge, lenko snapper dominant, striped sea pike 2nd.
108	2-3 tonne	1/16 sponge, although lenko snapper numerically dominant in catch striped sea pike dominant by weight in catch saved.
109	2-3 tonne	All fish, lenko snapper dominant, striped sea pike 2nd.
110	2-3 tonne	All fish, lenko snapper dominant, scads 2nd.
111	1-2 tonne	All fish except for insignificant amount sponge, lenko snapper dominant.
112	1 tonne	All fish, lenko snapper dominant, pink snapper 2nd.
113	0.8 tonne	All fish, lenko snapper dominant commercial, gummy sharks dominant in trash.
115	2-3 tonne	All fish, lenko snapper dominant, scads 2nd.
116	3-3.5 tonne	All fish, lenko snapper dominant, sunrise goatfish 2nd.
117	3-4 tonne	1/16 sponge, ½ commercial fish with lenko snapper dominant and juveniles of same present.
118	0.3-0.4 tonne	All fish, lenko snapper dominant.
123	2.5-3 tonne	1/16 sponge, lenko snapper dominant.
124	2-3 tonne	Lenko snapper dominant commercial, Captain's fish dominant in trash.

Table 1 (continued)

Shot No.	Total Catch	Comments
125	3-4 tonne	All fish, lenko snapper dominant, goatfish 2nd.
126	2-3 tonne	1/10 sponge, lenko snapper dominant, goatfish 2nd, gastropod molluscs in trash.
127	0.2 tonne	Pink snapper dominant, an old snapper burley bag with drawstring in trash.
128	0.2 tonne	All fish, pink snapper dominant.
129	0.2 tonne	Juvenile white-finned cavalla and lenko snapper dominant.
130	0.2-0.3 tonne	Lenko snapper dominant, only larger sizes saved, gastropod shells with hermit crabs in trash.
131	2 tonne	All fish, trevally dominant, pink snapper 2nd.
133	0.1 tonne	All fish.
137	0.15 tonne	All fish, silver trevally dominant and the only species saved.
138	0.8 tonne	1/8 large sponge, trevally dominant, chinaman fish 2nd, small and medium pearl perch present.
139	1-2 tonne	1/6 sponge, trevally dominant, northern scad 2nd.
140	6 tonne	Mostly sponge, chinaman fish dominant, sweetlip emperor 2nd.
141	1.5-2 tonne	½ sponge, ⅓ fish and crustacea, endeavour prawns, mantis shrimps and many red spot king prawns.
142	1 tonne	1/3 fish, chinaman fish dominant, sweetlip emperor 2nd.
143	1-1.5 tonne	1/10 sponge, some coral, cuttlefish dominant, northern scad 2nd.
146	1 tonne	½ sponge, ½ fish, lizard fish dominant in trash.
147	3 tonne	Mainly sponge, goatfish and sweetlip emperor equally dominant.
148	1-1.5 tonne	½ sponge, ½ fish, white finned cavalla dominant, goatfish 2nd.
151	0.6 tonne	1/6 sponge, lenko snapper dominant.
156	1 tonne	1/3 fish, northern scad dominant commercial, lizard fish dominant in trash, dead fish and sharks in trash.
157	3-4 tonne	½ sponge, 1/4 sand, goatfish and sweetlip emperor equally dominant, many juvenile sunrise goatfish.
158	2-3 tonne	2/3 large ball sponge, 1/3 fish, goatfish dominant, pearl perch 2nd.
159	7-8 tonne	9/10 large sponge 1/10 fish, small whaler sharks dominant species.
163	0.1 tonne	½ sponge, ½ fish.
164	1.5-2 tonne	1/10 sponge, 9/10 fish, pearl perch dominant, false snapper 2nd, lizard fish dominant in trash.
165	2 tonne	Lost 2/3 catch overboard, broke stb lazy line, ⅓ balance sponge, silver trevally dominant, sweetlip, emperor 2nd.
166	1-1.5 tonne	2/3 sponge and gorgonian coral 1/3 fish, sweetlip emperor dominant, net torn to stb, repaired.
171	0.4 tonne	All fish, false snapper dominant.
172	7-8 tonne	Mainly sponge, 1/8 fish, trevally dominant, sweetlip emperor 2nd.
173	9-10 tonne	Mainly sponge, load split codend; net changed, saddle goatfish dominant and juveniles present.
174	4-5 tonne	2/3 sponge, 1/3 fish, pearl perch dominant, sea bream and sweetlip emperor.
175	8 tonne	9/10 sponge, 1/10 fish, layang scad dominant.
176	0.8 tonne	Lizard fish dominant, presence of several large stingrays and shovelnose rays may have reduced net's efficiency.
177	0.3 tonne	Mainly trash fish, no sponge, lizard fish dominant in trash.
178	1 tonne	1/5 sponge, 4/5 elasmobranchs and fish, sweetlip emperor dominant.

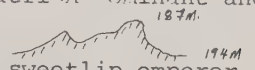


Table 1 (continued)

Shot No.	Total Catch	Comments
183	2-3 tonne	1/5 sponge, sunrise goatfish numerically dominant, but sweetlip emperor dominant by weight for saved species.
185	9-10 tonne	9/10 sponge, sweetlip emperor dominant species.
190	4-5 tonne	Mainly sponge, 1/5 fish, chinaman fish dominant.
192	9-10 tonne	4/5 sponge, sweetlip emperor dominant, chinaman fish 2nd, red bullseyes dominant in trash.
193	6-7 tonne	5/6 sponge, sweetlip emperor dominant, juveniles present.
194	2 tonne	1/4 sponge, 3/4 fish, red saddle goatfish numerically dominant but sweetlip emperor dominant by weight in catch saved.
195	4 tonne	1/2 sponge, red bullseye dominant numerically but greatest species weight saved was sweetlip emperor.
196	4 tonne	3/5 sponge, red bullseye dominant in catch and saved fish, sweetlip emperor 2nd.
197	0.4 tonne	3/4 sponge, lizard fish dominant in trash.
198	0.5 tonne	3/5 sponge, gulf gurnard perch dominant.
199	0.9 tonne	1/6 sponge, gulf gurnard perch dominant.
201	1.5 tonne	No sponge, all fish, silver trevally dominant.
202	1 tonne	1/3 trash fish, no sponge, silver trevally dominant, false snapper 2nd.
203	0.5 tonne	No sponge, all fish, striped sea pike dominant, silver trevally 2nd.
204	1 tonne	All fish, no sponge, silver trevally dominant, many fish present as juveniles.
205	0.4 tonne	No sponge 1/4 commercial fish, trevally dominant.
206	0.3 tonne	No sponge, poor catch for 2 hour shot, gulf gurnard perch dominant.
207	1.5-2 tonne	3/5 sponge, gulf gurnard perch numerically dominant, not saved, chinaman fish dominant in catch saved.
210	1 tonne	Lenko snapper dominant in catch saved, stripeys dominant in trash, many small whaler sharks.
211	4 tonne	1/12 sponge, Captain's fish dominant, pearl perch 2nd.
212	1 tonne	1/10 sponge, lenko snapper numerically dominant only larger sizes retained, pearl perch dominant saved species.
213	0.6 tonne	No sponge, layang scad dominant saved species.
217	0.06 tonne	Typical small deepwater catch, spookfish dominant in trash, very little saved.
218	0.5 tonne	No sponge, dory dominant in saved catch, dogfish and endeavour prawns dominant in trash.
219	0.2 tonne	Little commercial fish, net wing torn on rough bottom.
220	0.3 tonne	1/5 sponge, lenko snapper numerically dominant species.
221	0.8 tonne	1/3 sponge, nannygai dominant but not retained.
224	4-5 tonne	No sponge, 1/2 commercial fish, lenko snapper numerically dominant, only largest sizes saved, yellowtail scad dominant commercial species by weight.
225	3 tonne	1/20 sponge, mainly fish, striped sea pike dominant, scads 2nd.
226	0.5 tonne	Mainly fish, lenko snapper dominant.
227	2 tonne	Mainly fish, lenko snapper dominant, silver trevally 2nd.
228	2-2½ tonne	Mainly fish, lenko snapper numerically dominant, but silver trevally dominant by weight in catch saved.
229	0.5 tonne	Mainly fish, lenko snapper dominant.
230	1 tonne	3/5 sponge, lenko snapper dominant.
233	2-3 tonne	1/7 sponge, layang scad dominant, juvenile pink snapper present.

Table 1 (continued)

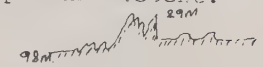
Shot No.	Total Catch	Comments
234	2 tonne	1/10 sponge, some large fish and shark present, adult and juvenile pink snapper present.
235	6-7 tonne	1/7 sponge, 4/7 jellyfish, pink snapper dominant in fish saved, silver trevally 2nd, 1 plastic sack containing black mineral sand in trash.
236	11-12 tonne	Mainly sponge, lenko snapper dominant.
237	2-2.5 tonne	1/5 sponge, lenko snapper dominant, juveniles on many species present.
238	0.25 tonne	All fish, piked and endeavour dogfish present and some medium deepwater species.
239	0.5 tonne	All fish, silver gaper dominant numerically but dogfish dominant by weight in the trash.
240	0.5 tonne	All fish, silver gaper dominant, some very large individuals present.
242	1.5 tonne	Mainly fish, mirror dory dominant, shot hauled early, rough ground.
243	2 tonne	3/4 sponge, propping dory dominant in trash, broke bridle wire to net after 5 min. trawling.
244	3-4 tonne	7/10 sponge, 3-spined cardinal fish dominant species in trash.
245	12-14 tonne	All sponge, except for 0.4 tonne fish, ½ of which were commercial species.
246	0.1-0.2 tonne	Mainly fish, alfonsin dominant, some catch may have been lost through torn net wing.
247	2-2.5 tonne	Mainly sponge, nannygai dominant fish, many 6cm juveniles present.
248	1.5 tonne	Mainly fish. narooma lantern fish dominant, many juvenile sawtail sharks present.
250	1.2 tonne	1/5 commercial fish, mirror dory and spookfish equally dominant, deepwater decapods present.
251	0.2 tonne	Another deepwater shot. Few commercial fish, piked dogfish dominant in trash.
252	0.08 tonne	A deepwater shot, rough ground, lizard fish and mirror dory dominant.
253	0.3 tonne	2/3 finger sponge, a small proportion of balance was commercial fish.
254	0.5 tonne	2/5 sponge, gulf gurnard perch dominant.
255	0.8 tonne	Gulf gurnard perch numerically dominant but greatest catch saved was mulloway.
258	2-3 tonne	Gulf gurnard perch dominant, 1 medium tiger shark, 1 rock lobster plus old pot in trash.
259	0.8-1 tonne	1/3 sponge, gulf gurnard dominant saved species, 5-yellow-lined goatfish dominant in trash.
260	2-2.5 tonne	2/5 sponge, yellowtail scad dominant, gulf gurnard perch 2nd.
262	3-4 tonne	Mainly sponge, very small commercial catch, 1 rusted 44 gallon fuel drum in trash.
263	0.4-0.5 tonne	Jack mackerel dominant species, little sponge, 6 western king prawns present.
267	0.15 tonne	Net destroyed on rough ground, most of catch lost overboard. 
268	2-3 tonne	1/3 sponge, yellowtail scad dominant saved species, swallowtails dominant in trash.
269	4 tonne	Mainly sponge,skipjack trevally dominant. 3 rock lobsters and dead fish and shark in catch.
270	20 tonne	All sponge, no commercial species, net badly damaged, major repairs undertaken.
271	4-5 tonne	Mainly kelp and sponge, no catch saved, 6 rock lobsters in trash.

Table 1 (continued)

Shot No.	Total Catch	Comments
272	5 tonne	Mainly sponge, some kelp, yellowtail scad dominant, 1 rock lobster in trash.
273	1.5 tonne	2/5 sponge, 1/15 kelp, yellowtail scad dominant, several large southern saucer scallops present.
274	10 tonne	Mainly sponge, significant sand present, no commercial catch, no species dominant.
275	12 tonne	Mainly sponge and weed, 1 rock lobster, stingarees dominant in trash.
276	3-4 tonne	½ sponge, 1/8 kelp, balance contained juvenile blue mackerel, silver whiting, skipjack trevally and yellowtail scad, a nursery.
277	--	Shot aborted early, damaged net.
278	--	Shot aborted early, damaged net.
279	0.3-0.4 tonne	Little catch, big-spined boarfish dominant. Rough ground.
280	4-5 tonne	Pure fish, dominated by big-spined boarfish, 1/3 of catch.
281	4-5 tonne	All fish, big-spined boarfish dominant in catch.
282	0.5-0.6 tonne	All fish, blue lantern fish numerically dominant, big-spined boarfish dominant saved species.
283	0.03 tonne	Shot up prematurely, rough ground.
284	0.7-0.8 tonne	All fish, endeavour dogfish dominant, a typical deepwater shot with few species.
286	4-5 tonne	Big-spined boarfish dominant, a few decapod crustacea, rough rising bottom.
287	0.3 tonne	Rough bottom, no net damage, little commercial fish again.
288	2 tonne	All fish, big-spined boarfish dominant saved species, blue lantern fish dominant trash species.
291	3-4 tonne	All fish, big-spined boarfish dominant saved species, orange-banded bellows fish dominant trash species.
292	0.6-0.7 tonne	Little commercial fish, orange-banded bellows fish dominant in trash, rough ground.
294	1.5 tonne	Some fine sand, deepwater cucumber fish dominant in trash.
295	3 tonne	Mainly fish, big-spined boarfish dominant saved species, silver gaper dominant in trash.
296	0.4-0.5 tonne	Little commercial fish.
297	5-6 tonne	Mainly large sponges, small commercial catch held over to next shot.
298	8-9 tonne	Mainly large sponge, no commercial catch, catch from 297 discarded.
300	>20 tonne	Mainly plate sponge, very little commercial catch.

Table 1 (continued)

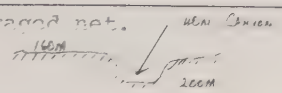
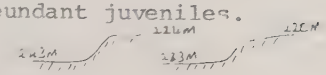
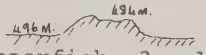
Shot No.	Total Catch	Comments
303	4-5 tonne	Mainly cup sponge, shot hauled early, broke ground rope and damaged net.
304	3-4 tonne	Mainly cup sponge, few fish, nothing saved, rough ground. 
307	1 tonne	3/5 cup sponge, 2/5 fish, latchet was dominant species but not saved.
309	>10 tonne	Mainly large sponges, few fish.
311	2-3 tonne	Mainly sponge, latchet dominant, nannygai 2nd as adults and abundant juveniles.
316	1.5 tonne	All sponge, but for a little commercial fish.
317	0.7-0.8 tonne	3/4 sponge. Jack mackerel dominant species, only a few saved. 
318	6-7 tonne	Mainly finger sponge, little commercial fish, spotted catshark dominant in trash.
320	4-5 tonne	Mainly sponge.
322	5-6 tonne	Mainly sponge, also bryozoans/plate corals, latchet dominant, juvenile nannygai only present.
328	2.5-3.5 tonne	No sponge, big-spined boarfish dominant, pink mackerel 2nd.
330	0.15 tonne	Broke warp and damaged net, big-spined boarfish dominant.
331	4-5 tonne	All fish, a large catch for a deepwater shot, big-spined boarfish dominant.
336	2 tonne	Mainly flat sponge. Captain's fish dominant, goatfish 2nd.
337	4-5 tonne	Mainly sponge, several species present as juveniles, brightly coloured filamentous anthrid, 5-lined goatfish, Jack mackerel, nannygai (adults also), silverside, veilfin, swallowtails.
338	1-2 tonne	½ finger and flat sponge, nothing dominant, jack mackerel in a running ripe condition.
339	15 tonne	Mainly sponge, small commercial catch, nothing dominant.
340	0.3 tonne	Equal quantities of finger sponge, endeavour dogfish and piked dogfish in trash.
341	0.05-0.1 tonne	All trash, nothing dominant, no commercial catch.
344	3 tonne	3/5 sponge, ball and finger 1/15 commercial fish, jack mackerel dominant, 2 size classes present.
345	1.5-2 tonne	All fish, dominant species cucumber fish, large numbers of juvenile piked dogfish and green stingarees.
346	2.5-3 tonne	All fish, big-spined boarfish dominant commercial, banded whiptail dominant in trash, juvenile piked dogfish and sawtail sharks present.
347	0.3-0.4 tonne	Mainly fish, some kelp, big-spined boarfish just dominant in catch saved, silver gaper dominant in trash. 
348	5-6 tonne	Pure fish, mainly big-spined boarfish. 3 gallon tin of cooking oil in trash.
349	13 tonne	Mixture of mainly sponge with kelp, Rhodophyta, plate coral, nothing dominant, 1 southern saucer scallop in trash.
350	1.5-2.5 tonne	Some sponge, Jack mackerel dominant mainly adolescent 16-19cm, many drink cans in trash and 1 southern saucer scallop.

Table 1 (continued)

Shot No.	Total Catch	Comments
355	0.3 tonne	All fish, dominant commercial mirror dory, silver gaper dominant in trash.
357	0.15 tonne	No commercial catch, silver gaper dominant in trash, shot hauled early, rough ground.
358	6-7 tonne	Mainly finger sponge, juvenile nannygai 5-12cm present, spiny gurnard dominant.
359	0.15-0.2 tonne	Little commercial fish, trash dominated by huge quantity of slipper lobster.
361	1 tonne	All fish, small commercial catch, trash dominated by pennant lantern fish.
365	0.15 tonne	All fish, short pointed snout whiptail dominant, warp shortened several times to lift net over patches of rough bottom.
366	1.5 tonne	7/10 sponge, finger type mainly, small quantity of commercial fish, some elasmobranchs.
367	5-6 tonne	3/4 finger and small ball sponges, 3-spined cardinal fish dominant in trash, few commercials.
368	3 tonne	2/3 sponge, veilfin dominant in catch and saved catch.
374	2-2.5 tonne	Mainly sponge, large veilfin dominant, piece of rock lobster rope in trash.
375	1.5 tonne	Mainly sponge, 1/4 fish, northern scad dominant.
378	1 tonne	Little sponge, nannygai dominant in catch saved, silverside dominant in trash.
379	1 tonne	Striped sea pike dominant fish.
380	3 tonne	Yellowtailed scad dominant fish.
381	7-8 tonne	2/3 commercial fish of which 80% yellowtail scad and 20% lenko snapper.
382	4-5 tonne	Very little sponge, lenko snapper dominant, yellowtail scad 2nd.
383	1.5 tonne	Mainly fish, lenko snapper dominant, smaller sizes trashed, 1 gallon tin in trash.
385	1.5-2 tonne	1/4 small ball sponge, lenko snapper dominant, smaller sizes trashed.
386	2.5-3 tonne	1/6 ball sponge, lenko snapper dominant.
387	2-2.5 tonne	Lenko snapper dominant.
388	2 tonne	Almost pure lenko, of which they saved only 0.2 tonne of larger sized fish.
389	1.5 tonne	All fish, lenko snapper dominant saved species, cucumber fish dominant in trash.
390	0.2 tonne	All fish, shot hauled early due to rough ground.
391	0.1 tonne	Many deepwater fish species present as juveniles, big-spined boarfish, Darwin's roughy, silver herring with barbel, armoured sea robin, spookfish, banded whiptail.
393	0.25-0.3 tonne	Very small commercial catch, dominant trash fish were silver gapers, deepwater red scorpaenid 2nd.
394	0.25-0.3 tonne	Very deepwater fish fauna, 3 species new to cruise.
395	0.3-0.35 tonne	Very small commercial catch, deepwater shot with silver gaper dominant in catch.
397	0.3 tonne	Threadfin bullseye dominant saved species, silver gaper dominant in trash.
398	0.3 tonne	Little commercial fish, silver gaper dominant in trash.
399	0.1-0.15 tonne	All fish, reticulated dory dominant in catch saved.

Table 1 (continued).

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	2 tonne	[illegible]
[illegible]	[illegible]	Little sponge, nannygai dominant, veilfin 2nd.
[illegible]	[illegible]	1/7 jellyfish, veilfin numerically dominant but pink snapper dominant in catch saved
424	0.3 tonne	1/10 cup and finger sponge, veilfin dominant in catch and saved catch.

Table 2 Details of trawl shots, the catch in 11 kg pans and catch rate in kg/hour.
Trawls marked * gave economic catch rates for this class of Japanese vessel.

Shot No.	Date	Set Time	Up Time	Setting Position Lat.	Setting Position Long.	Hauling Position Lat.	Hauling Position Long.	Depth Range (m)	Catch in Pans	Catch Rate
A133	13.7.79	0230	0630	21°18'	114°23'	21°27'	114°12'	190 - 191	53	146
A134		1630	1830	21°32'	114°08'	21°37'	114°00'	194 - 225	17	94
A135	14.7.79	0240	0440	22°50'	113°27'	22°55'	113°25'	190 - 192	54	297
A136		0520	0720	22°58'	113°24'	23°05'	113°22'	194 - 198	5	28
A137		0800	1000	23°07'	113°20'	23°10'	113°18'	196 - 202	3	17
A138		1110	1310	23°19'	113°21'	23°27'	113°20'	123 - 127	19	105
A139		1410	1610	23°24'	113°12'	23°35'	113°07'	144 - 167	49	270
A140		1645	1845	23°35'	113°06'	23°41'	113°02'	166 - 196	6	33
A141		2020	2220	23°47'	113°13'	23°42'	113°18'	85 - 96	30	165
A142		2250	2330	23°41'	113°19'	23°38'	113°20'	74 - 85	16	264
A143	15.7.79	0015	0230	23°36'	113°22'	23°29'	113°25'	67 - 71	31	152
A144		0335	0535	23°27'	113°23'	23°34'	113°21'	96 - 104	64	352
A145		0610	0810	23°35'	113°19'	23°42'	113°14'	102 - 107	50	275
A146		0840	1040	23°43'	113°13'	23°51'	113°11'	96 - 106	50	275
A147		1130	1330	23°52'	113°09'	23°58'	113°02'	101 - 110	148	814 *
A148		1405	1605	23°57'	113°01'	23°53'	113°05'	110 - 112	96	528
A149		1630	1830	23°54'	113°05'	23°58'	112°59'	108 - 118	107	589
A150		1910	2110	23°58'	112°59'	23°52'	113°05'	115 - 120	29	160
A151		2140	2340	23°53'	113°06'	23°48'	113°11'	110	25	138
A152	16.7.79	0010	0210	23°47'	113°10'	23°54'	113°05'	105 - 110	32	176
A153		0245	0445	23°55'	113°03'	23°56'	112°54'	115 - 155	29	160
A154		0520	0720	23°56'	112°49'	24°02'	112°42'	158 - 184	22	121
A155		0755	0955	24°02'	112°42'	24°09'	112°37'	183 - 193	49	270
A156		1040	1240	24°10'	112°33'	24°16'	112°29'	236 - 243	20	110
A157		1320	1520	24°17'	112°27'	24°24'	112°22'	281 - 296	249	1370 *
A158		1605	1935	24°22'	112°22'	24°12'	112°29'	296 - 320	152	478
A159		2025	2300	24°13'	112°28'	24°22'	112°25'	265 - 287	143	609
A160	17.7.79	2350	0230	24°22'	112°25'	24°13'	112°30'	258 - 259	68	281
A161		0315	0615	24°13'	112°30'	24°22'	112°24'	170 - 278	94	345
A162		0700	0900	24°25'	112°22'	24°31'	112°19'	275 - 298	94	517
A163		0950	1150	24°30'	112°21'	24°23'	112°24'	249 - 252	110	605
A164		1230	1445	24°24'	112°25'	24°31'	112°21'	229 - 230	93	455
A165		1520	1720	24°32'	112°19'	24°39'	112°18'	260 - 267	39	215
A166		1800	2015	24°38'	112°17'	24°30'	112°20'	278 - 280	20	98
A167		2100	2300	24°28'	112°20'	24°21'	112°24'	295 - 315	52	286
A168	18.7.79	0020	0240	24°16'	112°26'	24°10'	112°31'	280 - 330	5	24
A169		0450	0630	24°14'	112°28'	24°22'	112°33'	280 - 281	80	352
A170		0725	0935	24°24'	112°23'	24°17'	112°27'	259 - 265	99	503
A171		1020	1250	24°18'	112°27'	24°26'	112°23'	247 - 250	113	497
A172		1330	1530	24°25'	112°23'	24°19'	112°27'	248 - 252	37	204
A173		1610	1820	24°19'	112°27'	24°26'	112°23'	240 - 246	93	472
A174		1855	2055	24°28'	112°22'	24°35'	112°20'	237 - 245	60	330
A175		2135	2335	24°37'	112°19'	24°43'	112°18'	227 - 239	30	165
A176	19.7.79	0015	0215	24°45'	112°16'	24°52'	112°14'	258 - 260	6	33
A177		0305	0505	24°52'	112°14'	24°46'	112°15'	278 - 280	9	50
A178		0600	0800	24°47'	112°19'	24°54'	112°18'	184 - 188	4	22
A179		0900	1100	24°56'	112°14'	25°05'	112°13'	237 - 244	325	1788 *
A180		1145	1445	25°03'	112°13'	24°54'	112°15'	240 - 249	702	2574 *
A181		1535	1900	24°55'	112°15'	25°08'	112°12'	236 - 242	276	889 *
A182	20.7.79	0600	0930	25°23'	112°12'	25°10'	112°12'	235 - 247	10	31
A183		1010	1310	25°03'	112°13'	24°58'	112°13'	242 -261	359	1316 *
A184		1400	1820	24°58'	112°13'	25°12'	112°11'	262 - 270	152	386
A185		1910	2210	25°13'	112°10'	25°23'	112°10'	273 - 280	16	59
A186		2310	0210	25°25'	112°11'	25°34'	112°09'	242 - 255	7	26
A187	21.7.79	0320	0600	25°36'	112°13'	25°43'	112°14'	202 - 232	2	8
A188		0650	0910	25°47'	112°13'	25°54'	112°16'	242 - 252	16	75
A189		1005	1205	25°54'	112°17'	25°47'	112°16'	197 - 216	37	204
A190		1250	1450	25°46'	112°16'	25°51'	112°19'	186 - 193	39	215
A191		1555	1850	25°50'	112°18'	25°57'	112°21'	186 - 193	108	407

Table 5 (continued)

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 2 (continued)

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Depth Range (m)	Catch in Pans	Catch Rate
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	138 - 140	2	22
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	138	1	11
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	143 - 147	6	66
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	224	-	-
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	340 - 348	4	73
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	165 - 178	3	38
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3	160
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	33 - [illegible]	5	55
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	34 - 38	-	-
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10	176
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2	11
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2	13
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4	29
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	38	279
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	14	103
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	142 - 160	13	119
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	248 - 250	5	55
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	186 - 216	10	73
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	186 - 222	3	44
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	134 - 136	5	37
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	129 - 130	38	279
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	158 - 161	3	22
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	179 - 183	5	37
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	180 - 210	2	20
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	150 - 156	4	29
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	152 - 162	14	103
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	173 - 180	6	44
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	176 - 182	3	22
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	176 - 180	8	53
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	184 - 186	9	66
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	186 - 201	18	183
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	202 - 216	23	174
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	195 - 225	65	429
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	198 - 210	155	787
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	193 - 198	13	83
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	190	26	143
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	195 - 210	5	28
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	208 - 210	6	33
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	200 - 210	31	91
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	204 - 226	40	198
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	192 - 208	61	298
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	194 - 210	110	392
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	206 - 210	19	70
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	207 - 210	21	77
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	222	15	55
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	39 - 203	53	260
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.39 - 200	.54	572
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] - .39	.48	814 *
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.30 - 200	.50	388
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.31 - .35	26	98
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.30 - 20.	.2	53
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.33 - .37	.2	66
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.33 - .36	.7	33
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	33 - 2.3	43	249
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	33 - .33	114	627
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] - .33	60	330
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] - [illegible]	185	555
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] - [illegible]	53	202
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	31 - .33	2	13
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21 - 2.3	3	23
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.4 - 222	3	24
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.4 - 260	3	26
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	33 - .35	13	402
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	33 - .33	3	22
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	184 - 186	3	22

Table 2 (continued)

Shot No.	Date	Set Time	Up Time	Setting Position Lat.	Setting Position Long.	Hauling Position Lat.	Hauling Position Long.	Depth Range (m)	Catch in Pans	Catch Rate
134	11.8.79	0300	0500	24°28'	112°21'	24°21'	112°25'	254 - 268	6	33
135		0545	0745	24°18'	112°27'	24°12'	112°33'	231 - 246	6	33
136		0825	0950	24°11'	112°36'	24°06'	112°39'	185 - 193	84	652
137		1030	1230	24°06'	112°38'	24°02'	112°44'	182 - 205	31	170
138		1300	1500	23°59'	112°49'	23°58'	112°57'	120 - 158	29	160
139		1535	1830	23°59'	112°59'	23°50'	113°07'	110 - 114	86	324
140		1855	2055	23°47'	113°08'	23°41'	113°13'	107 - 116	26	143
141		2120	2320	23°40'	113°15'	23°34'	113°19'	104 - 112	45	248
142		2345	0145	23°34'	113°19'	23°40'	113°13'	111 - 119	39	215
143	12.8.79	0215	0415	23°39'	113°13'	23°33'	113°18'	115 - 120	35	192
144		0450	0720	23°34'	113°19'	23°41'	113°12'	110 - 117	56	246
145		0755	1000	23°40'	113°14'	23°36'	113°19'	103 - 115	61	322
146		1030	1230	23°36'	113°18'	23°43'	113°14'	104 - 108	27	148
147		1255	1455	23°45'	113°12'	23°51'	113°07'	107 - 114	25	138
148		1525	1725	23°52'	113°06'	23°58'	113°01'	109 - 112	44	242
149		1755	1955	23°57'	113°01'	23°51'	113°04'	114 - 122	23	126
150		2020	2220	23°50'	113°06'	23°44'	113°10'	118 - 122	15	82
151		2250	0050	23°42'	113°12'	23°36'	113°18'	110 - 116	14	77
152	13.8.79	0115	0315	23°34'	113°19'	23°38'	113°22'	109 - 112	21	116
153		0400	0555	23°38'	113°23'	23°35'	113°20'	98 - 104	39	224
154		0625	0825	23°35'	113°20'	23°39'	113°23'	95 - 100	79	434
155		0850	1015	23°30'	113°23'	23°35'	113°21'	86 - 90	29	225
156		1055	1255	23°34'	113°21'	23°27'	113°24'	94 - 101	17	94
157		1320	1520	23°28'	113°23'	23°35'	113°20'	101 - 108	35	192
158		1545	1740	23°36'	113°19'	23°43'	113°15'	100 - 102	36	207
159		1810	2010	23°45'	113°13'	23°51'	113°08'	100 - 106	16	88
160		2045	2240	23°53'	113°07'	23°57'	113°02'	104 - 110	14	80
161		2305	0105	23°58'	113°03'	23°53'	113°08'	100 - 106	10	55
162	14.8.79	0130	0315	23°53'	113°08'	23°59'	113°05'	96 - 98	18	113
163		1305	1410	23°59'	113°11'	23°55'	113°12'	80 - 84	2	20
164		1440	1640	23°53'	113°15'	23°46'	113°16'	84 - 91	29	160
165		1700	1835	23°44'	113°17'	23°39'	113°20'	80 - 92	53	365
166		2120	2150	23°35'	113°21'	23°34'	113°23'	68 - 75	10	220
167		2240	0040	23°31'	113°24'	23°26'	113°30'	65 - 73	24	132
168	15.8.79	0135	0245	23°21'	113°31'	23°17'	113°32'	72 - 76	12	113
169		0305	0340	23°18'	113°31'	23°19'	113°28'	75 - 78	14	264
170		0455	0625	23°15'	113°28'	23°09'	113°28'	100 - 110	13	95
171		0700	0840	23°07'	113°30'	23°01'	113°32'	98 - 106	24	158
172		0910	1105	22°58'	113°33'	22°53'	113°27'	87 - 130	61	315
173		1140	1310	22°54'	113°28'	22°49'	113°26'	102 - 202	11	81
174		1420	1550	22°52'	113°26'	22°58'	113°26'	136 - 178	43	350
175		1630	1830	22°59'	113°26'	23°07'	113°24'	126 - 128	114	627
176		1905	2050	23°09'	113°24'	23°16'	113°24'	114 - 119	10	63
177		2130	2330	23°15'	113°26'	23°08'	113°27'	109 - 114	14	77
178	16.8.79	0000	0140	23°06'	113°27'	23°01'	113°27'	110 - 112	21	138
179		0210	0355	23°01'	113°28'	23°07'	113°27'	108 - 110	56	352
180		0420	0620	23°07'	113°27'	23°00'	113°28'	108 - 109	21	116
181		0650	0840	23°00'	113°27'	23°07'	113°25'	117 - 123	72	432
182		0920	1120	23°05'	113°25'	22°58'	113°27'	122 - 128	90	495
183		1150	1350	22°59'	113°27'	23°07'	113°26'	115 - 117	53	292
184		1415	1620	23°07'	113°27'	23°00'	113°24'	120 - 134	80	422
185		1655	1855	22°59'	113°27'	23°06'	113°24'	123 - 134	72	396
186		1930	2130	23°05'	113°24'	22°58'	113°27'	127 - 137	165	908 *
187		2210	0010	22°59'	113°26'	23°04'	113°27'	108 - 140	31	170
188	17.8.79	0105	0245	23°07'	113°27'	23°00'	113°28'	110 - 114	22	145
189		0315	0515	23°00'	113°29'	23°07'	113°27'	106 - 109	38	209
190		0545	0735	23°07'	113°26'	23°01'	113°25'	120 - 140	22	132
191		0810	0940	23°01'	113°25'	22°54'	113°27'	138 - 139	40	293
192		1015	1205	22°54'	113°27'	23°01'	113°25'	140 - 143	48	288
193		1235	1405	23°01'	113°25'	22°56'	113°27'	122 - 135	46	337
194		1440	1610	22°56'	113°29'	23°01'	113°30'	105 - 111	61	447
195		1640	1830	23°02'	113°30'	22°56'	113°30'	103 - 108	118	708
196		1910	2010	22°56'	113°31'	23°03'	113°31'	98 - 105	49	270
197		2150	2350	23°03'	113°30'	23°09'	113°26'	102 - 110	16	88
198	18.8.79	0145	0315	23°21'	113°18'	23°26'	113°15'	132 - 138	5	37
199		0345	0515	23°27'	113°13'	23°32'	113°11'	148 - 152	7	51
200		0550	0730	23°33'	113°10'	23°38'	113°06'	150 - 152	44	290

Table 2 (continued)

Shot No.	Date	Set Time	Up Time	Setting Position Lat.	Setting Position Long.	Hauling Position Lat.	Hauling Position Long.	Depth Range (m)	Catch in Pans	Catch Rate
201	18.8.79	0830	1010	23°39'	113°08'	23°34'	113°12'	135 - 142	85	561
202		1045	1245	23°34'	113°14'	23°41'	113°09'	130 - 134	41	660
203		1320	1520	23°42'	113°07'	23°48'	113°02'	142 - 146	48	269
204		1550	1750	23°49'	113°01'	23°55'	112°57'	144 - 146	52	286
205		1820	2020	23°56'	112°55'	23°59'	112°48'	150 - 160	13	72
206		2120	2320	24°02'	112°43'	24°08'	112°39'	184 - 189	3	16
207		2350	0150	24°08'	112°37'	24°14'	112°35'	185 - 190	18	99
208	19.8.79	0250	0450	24°15'	112°29'	24°21'	112°26'	248 - 257	24	132
209		0535	0735	24°22'	112°26'	24°26'	112°23'	240 - 260	68	374
210		0820	0920	24°25'	112°25'	24°22'	112°27'	220 - 223	8	88
211		1020	1220	24°23'	112°29'	24°27'	112°27'	185 - 187	80	440
212		1320	1520	24°29'	112°27'	24°33'	112°25'	185 - 190	43	236
213		1610	1810	24°36'	112°24'	24°41'	112°23'	184 - 186	17	94
214		2205	0005	25°01'	112°18'	25°06'	112°17'	191 - 193	-	-
215	20.8.79	0035	0235	25°08'	112°17'	25°13'	112°17'	190 - 192	12	66
216		0320	0520	25°17'	112°17'	25°23'	112°16'	190 - 196	5	28
217		0800	0845	25°38'	112°09'	25°40'	112°08'	460 - 512	1	15
218		0950	1150	25°42'	112°07'	25°47'	112°08'	474 - 520	4	22
219		1305	1505	25°50'	112°08'	25°55'	112°11'	500 - 580	4	22
220		1930	2130	26°03'	112°36'	26°08'	112°41'	137 - 142	8	44
221		2210	0010	26°10'	112°42'	26°15'	112°47'	131 - 138	8	44
222	21.8.79	0045	0245	26°17'	112°48'	26°20'	112°55'	133	11	60
223		0315	0515	26°20'	112°56'	26°25'	113°01'	131 - 133	21	116
224		0625	0825	26°27'	112°57'	26°22'	112°49'	139 - 140	173	951*
225		0905	1105	26°21'	112°47'	26°16'	112°41'	142 - 149	103	566
226		1135	1335	26°14'	112°40'	26°08'	112°35'	148	20	110
227		1420	1620	26°13'	112°33'	26°19'	112°37'	154 - 156	49	270
228		1650	1850	26°22'	112°39'	26°27'	112°47'	155 - 156	73	402
229		2000	2200	26°29'	112°44'	26°36'	112°49'	156 - 157	22	121
230		2240	0040	26°38'	112°50'	26°44'	112°54'	158 - 162	10	55
231	22.8.79	0120	0320	26°43'	112°59'	26°38'	112°56'	150 - 155	10	55
232		0350	0520	26°34'	112°55'	26°29'	112°53'	142 - 146	7	51
233		0650	0850	26°26'	113°02'	26°33'	113°04'	130 - 134	72	396
234		0920	1120	26°34'	113°04'	26°41'	113°02'	130 - 131	45	248
235		1150	1350	26°44'	113°02'	26°51'	113°03'	130 - 132	22	121
236		1425	1625	26°52'	113°02'	26°57'	112°59'	130 - 135	22	121
237		1725	1925	27°00'	112°56'	26°52'	112°56'	172 - 180	44	242
238		2115	2315	26°59'	112°43'	27°06'	112°46'	292 - 307	7	38
239		2350	0150	27°09'	112°47'	27°16'	112°50'	294 - 297	1	6
240	23.8.79	0230	0430	27°18'	112°50'	27°26'	112°52'	300 - 310	2	11
241		0645	0730	27°43'	113°00'	27°46'	113°00'	315 - 337	3	44
242		0930	1040	27°53'	113°03'	27°57'	113°06'	384 - 404	18	170
243		1200	1205	28°01'	113°09'	28°01'	113°09'	280	2	264
244		1605	1805	28°28'	113°27'	28°35'	113°30'	184 - 200	22	121
245		1840	2040	28°38'	113°31'	28°45'	113°37'	190 - 220	17	94
246		2300	2350	28°59'	113°43'	29°02'	113°44'	468 - 480	4	53
247	24.8.79	0110	0240	29°06'	113°55'	29°11'	113°58'	188 - 192	3	22
248		0340	0540	29°16'	113°57'	29°22'	114°01'	318 - 350	3	17
249		0625	0815	29°24'	114°01'	29°31'	114°06'	305 - 320	24	144
250		0940	1140	29°37'	114°11'	29°43'	114°16'	442 - 510	23	126
251		1230	1250	29°45'	114°17'	29°46'	114°18'	337 - 345	4	132
252		1400	1440	29°47'	114°19'	29°49'	114°20'	380 - 480	1	16
253		1905	2105	30°27'	114°37'	30°33'	114°40'	188 - 210	4	22
254		2145	2345	30°37'	114°41'	30°44'	114°44'	197 - 203	4	22
255	25.8.79	0035	0235	30°45'	114°48'	30°53'	114°51'	131 - 138	13	72
256		0310	0510	30°54'	114°52'	31°01'	114°55'	130 - 132	20	110
257		0610	0810	31°03'	114°55'	31°10'	114°58'	130 - 132	15	82
258		0840	1040	31°13'	114°59'	31°20'	115°00'	130 - 132	8	44
259		1110	1310	31°22'	115°02'	31°30'	115°05'	130 - 136	7	38
260		1340	1540	31°31'	115°06'	31°39'	115°08'	130 - 133	20	110
261		1620	1820	31°41'	115°06'	31°48'	115°10'	156 - 164	5	28
262		1855	2055	31°50'	115°11'	31°57'	115°13'	156 - 197	4	22
263		2145	2345	31°59'	115°12'	32°07'	115°13'	131 - 135	4	22
264	26.8.79	0010	0210	32°08'	115°14'	32°16'	115°14'	130 - 135	5	28
265		0240	0441	32°16'	115°14'	32°23'	115°09'	130 - 132	17	94
266		0510	0710	32°24'	115°09'	32°30'	115°04'	130	9	50
267		0755	0915	32°36'	115°06'	32°39'	115°03'	89 - 98	4	33
268		1100	1300	32°44'	115°01'	32°51'	114°56'	98 - 108	15	82
269		1325	1525	32°52'	114°52'	32°59'	114°51'	96 - 106	8	44
270		1550	1750	33°01'	114°50'	33°09'	114°48'	94 - 104	6	33

Table 2 (continued)

Trap No.	Date	Set Time	Up Time	Setting Position Lat.	Setting Position Long.	Hauling Position Lat.	Hauling Position Long.	Depth Range (m)	Catch in Pans	Catch Rate
[illegible]	[illegible]	0330	0430	32°42'	115°08'	32°38'	115°10'	50 - 52	-	-
[illegible]		0600	0700	32°35'	115°16'	32°39'	115°15'	44 - 46	9	99
[illegible]		0730	0830	32°40'	115°14'	32°45'	115°12'	43 - 46	16	176
[illegible]		0855	1055	32°46'	115°12'	32°53'	115°09'	42 - 44	-	-
[illegible]		1135	1238	32°54'	115°08'	32°58'	115°07'	42 - 45	7	77
[illegible]		1315	1415	33°01'	115°06'	33°04'	115°02'	52 - 57	38	418
[illegible]		1440	1450	33°05'	114°59'	33°05'	114°58'	50	-	-
[illegible]		1550	1600	33°06'	114°57'	33°06'	114°56'	53 - 56	-	-
[illegible]	[illegible]	0930	1015	34°17'	114°27'	34°19'	114°28'	536 - 540	9	132
[illegible]		1130	1400	34°22'	114°29'	34°30'	114°30'	488 - 496	108	475
[illegible]		1530	1730	34°30'	114°34'	34°23'	114°33'	372 - 408	87	478
[illegible]		1820	1915	34°19'	114°31'	34°16'	114°30'	396 - 412	8	96
[illegible]	[illegible]	0720	0735	34°23'	114°27'	34°24'	114°27'	574 - 570	-	-
[illegible]		0850	0940	34°26'	114°29'	34°33'	114°29'	540 - 550	3	18
[illegible]		1145	1155	34°38'	114°32'	34°38'	114°32'	552 - 553	-	-
[illegible]		1525	1725	34°38'	114°36'	34°32'	114°33'	398 - 408	95	522
[illegible]		1820	2020	34°32'	114°35'	34°38'	114°38'	336 - 354	8	44
[illegible]	[illegible]	0640	0840	34°48'	114°42'	34°42'	114°38'	430 - 478	25	137
[illegible]		1000	1200	34°43'	114°36'	34°48'	114°40'	484 - 541	28	154
[illegible]		1300	1500	34°48'	114°37'	34°42'	114°31'	590 - 602	4	22
[illegible]		1625	1825	34°39'	114°34'	34°33'	114°31'	476 - 480	57	314
[illegible]	[illegible]	0715	0900	34°55'	114°51'	34°52'	114°44'	532 - 575	4	25
[illegible]		1015	1145	34°53'	114°48'	34°55'	114°53'	470 - 490	17	125
[illegible]		1245	1445	34°54'	114°53'	34°51'	114°46'	340 - 356	10	55
[illegible]		1530	1730	34°50'	114°45'	34°44'	114°40'	360 - 370	51	281
[illegible]		1825	2025	34°45'	114°38'	34°51'	114°45'	479 - 505	10	55
[illegible]	[illegible]	0640	0730	35°03'	115°24'	35°03'	115°27'	174 - 210	-	-
[illegible]		0820	0920	35°02'	115°28'	35°00'	115°23'	146 - 147	-	-
[illegible]		1015	1115	34°57'	115°28'	34°59'	115°32'	135 - 137	-	-
[illegible]		1200	1300	34°55'	115°35'	34°53'	115°31'	95 - 98	2	22
[illegible]		1350	1450	34°49'	115°34'	34°51"	115°38'	46 - 52	5	55
[illegible]		1530	1630	35°47'	115°39'	34°44'	115°35'	47 - 48	-	-
[illegible]		1700	1725	34°46'	115°32'	34°45'	115°30'	50 - 52	1	26
[illegible]	[illegible]	0610	0645	35°13'	115°59'	35°13'	115°57'	152 - 200	-	-
[illegible]		0810	0820	35°09'	115°55'	35°09'	115°54'	137	-	-
[illegible]		1005	1040	35°10'	115°53'	35°09'	115°51'	220 - 226	1	19
[illegible]		1120	1305	35°07'	115°47'	35°04'	115°43'	219 - 240	-	-
[illegible]		1345	1425	35°04'	115°45'	35°06'	115°48'	170 - 176	-	-
[illegible]		1500	1620	35°04'	115°47'	35°02'	115°42'	131 - 158	2	16
[illegible]		715	1805	35°03'	115°38'	35°03'	115°35'	138 - 144	-	-
[illegible]		2035	2135	35°03'	115°21'	35°02'	115°18'	156 - 163	1	11
[illegible]		2215	2315	35°01'	115°16'	35°00'	115°13'	159 - 168	3	33
[illegible]		2355	0055	34°58'	115°09'	34°56'	115°06'	155 - 158	5	55
[illegible]	[illegible]	0140	0240	34°56'	115°05'	34°55'	115°02'	156 - 168	3	33
[illegible]		0320	0420	34°55'	115°00'	34°54'	114°56'	174 - 186	2	22
[illegible]		0510	0610	34°53'	114°55'	34°51'	114°52'	180 - 200	3	33
[illegible]		0700	0830	34°30'	114°49'	34°46'	114°44'	216 - 243	5	37
[illegible]		0915	1100	34°46'	114°46'	34°50'	114°51'	167 - 174	4	25
[illegible]		1140	1240	34°48'	114°51'	34°45'	114°48'	157 - 160	2	22
[illegible]		320	1420	34°43'	114°46'	34°40'	114°45'	154 - 158	1	11
[illegible]		1510	1700	34°38'	114°41'	34°31'	114°37'	160 - 167	10	60
[illegible]		735	1925	34°30'	114°37'	34°23'	114°36'	151 - 157	5	30
[illegible]		2015	2200	34°24'	114°35'	34°30'	114°36'	155 - 172	21	132
[illegible]		2245	2345	34°28'	114°40'	34°24'	114°38'	146 - 149	32	352
[illegible]	[illegible]	0025	0115	34°22'	114°38'	34°19'	114°37'	144	5	55
[illegible]		0200	0300	34°16'	114°37'	34°12'	114°36'	144 - 146	6	66
[illegible]		0330	0430	34°11'	114°36'	34°08'	114°34'	147 - 150	5	55
[illegible]		0700	0900	34°24'	114°32'	34°30'	114°33'	374 - 398	52	286
[illegible]		1000	1200	34°30'	114°31'	34°22'	114°31'	430 - 440	85	467
[illegible]		[illegible]	1400	34°20'	114°30'	34°17'	114°29'	438 - 460	10	110
[illegible]		1600	1815	34°05'	114°27'	33°58'	114°27'	352 - 405	121	592

Table 2 (continued)

Shot No.	Date	Set Time	Up Time	Setting Position Lat.	Setting Position Long.	Hauling Position Lat.	Hauling Position Long.	Depth Range (m)	Catch in Pans	Catch Rate
332	5.9.79	0215	0415	33°33'	114°31'	33°39'	114°31'	172 - 188	20	110
333		0510	0610	33°40'	114°30'	33°43'	114°30'	173 - 186	6	66
334		0650	0750	33°40'	114°34'	33°36'	114°34'	160	2	22
335		0825	0925	33°33'	114°34'	33°29'	114°35'	146 - 148	2	22
336		1005	1105	33°28'	114°41'	33°24'	114°42'	102 - 114	4	44
337		1150	1340	33°20'	114°37'	33°14'	114°37'	143 - 154	28	168
338		1425	1535	33°13'	114°34'	33°18'	114°33'	190 - 202	1	9
339		1610	1740	33°19'	114°33'	33°23'	114°22'	180 - 182	9	66
340		2040	2220	33°03'	114°34'	32°58'	114°34'	400 - 403	4	26
341		2320	0100	32°59'	114°33'	33°05'	114°32'	499 - 502	-	-
342	6.9.79	0155	0355	33°04'	114°34'	32°59'	114°37'	300 - 304	4	22
343		0420	0600	32°58'	114°38'	32°52'	114°41'	298 - 300	3	20
344		0650	0830	32°52'	114°44'	32°46'	114°46'	204 - 210	49	323
345		0910	1030	32°44'	114°45'	32°39'	114°49'	300 - 302	13	86
346		1135	1315	32°38'	114°47'	32°33'	114°51'	400 - 402	11	73
347		1415	1535	32°30'	114°49'	32°26'	114°51'	496 - 500	7	58
348		1630	1810	32°25'	114°53'	32°21'	114°58'	440 - 448	134	884*
349		2115	2215	32°35'	115°21'	32°31'	115°23'	41	1	11
350	7.9.79	0115	0215	32°08'	115°16'	32°04'	115°15'	130 - 145	13	143
351		0300	0330	32°03'	115°15'	32°01'	115°15'	130	-	-
352		0415	0515	31°59'	115°15'	31°55'	115°15'	130 - 138	22	242
353		0620	0800	31°56'	115°11'	32°02'	115°11'	190 - 207	2	13
354		0920	1040	32°06'	115°07'	32°11'	115°04'	332 - 340	59	487
355		1140	1155	32°14'	115°03'	32°15'	115°03'	382 - 392	8	352
356		1320	1340	32°14'	115°00'	32°13'	115°00'	500 - 510	-	-
357		1500	1520	32°10'	115°04'	32°09'	115°04'	432 - 444	5	165
358		1745	1925	31°52'	115°08'	31°48'	115°04'	196 - 206	-	-
359		2020	2200	31°46'	115°01'	31°41'	114°59'	360 - 384	5	33
360		2300	0000	31°38'	114°58'	31°34'	114°57'	403 - 408	-	-
361	8.9.79	0130	0310	31°34'	114°56'	31°28'	114°55'	350 - 354	8	53
362		0400	0540	31°23'	114°55'	31°19'	114°54'	350 - 360	10	66
363		0620	0800	31°17'	114°54'	31°12'	114°53'	298 - 310	7	46
364		0850	0950	31°69'	114°52'	31°05'	114°51'	287 - 290	4	44
365		1030	1115	31°02'	114°49'	30°59'	114°48'	390 - 410	-	-
366		1145	1250	30°58'	114°48'	30°55'	114°47'	229 - 240	1	10
367		1400	1540	30°49'	114°45'	30°43'	114°42'	206 - 220	7	46
368		1735	1905	30°23'	114°41'	30°18'	114°39'	130	33	242
369		2000	2130	30°17'	114°39'	30°13'	114°37'	130 - 133	-	-
370		2315	0045	30°06'	114°35'	30°02'	114°34'	130 - 132	2	15
371	9.9.79	0120	0220	30°03'	114°33'	29°57'	114°32'	130 - 133	5	55
372		0250	0420	29°56'	114°31'	29°52'	114°29'	130 - 133	28	205
373		0500	0630	29°50'	114°27'	29°45'	114°24'	130	22	161
374		0715	0845	29°41'	114°22'	29°37'	114°19'	130 - 150	11	81
375B		1335	1435	29°20'	114°07'	29°17'	114°05'	130 - 136	6	66
376		1520	1530	29°14'	114°03'	29°14'	114°03'	135	-	-
377	10.9.79	0600	0740	28°14'	113°24'	28°09'	113°20'	170 - 178	-	-
378		0840	1020	28°04'	113°18'	27°58'	113°16'	181 - 186	12	79
379		1100	1240	27°56'	113°15'	27°50'	113°14'	185 - 186	34	224
380		1330	1450	27°50'	113°05'	27°45'	113°05'	234 - 236	134	1106*
381		1520	1700	27°43'	113°03'	27°37'	113°01'	226 - 228	471	3109*
382		1740	2220	27°35'	113°00'	27°20'	112°53'	224 - 230	76	179
383		2320	0120	27°21'	112°59'	27°26'	113°02'	184 - 186	23	126
384	11.9.79	0215	0415	27°25'	113°04'	27°19'	113°00'	164 - 170	8	44
385		0615	0815	27°18'	112°52'	27°11'	112°50'	228 - 236	29	159
386		0850	1050	27°10'	112°50'	27°04'	112°47'	230 - 234	59	325
387		1130	1310	27°03'	112°47'	26°57'	112°44'	226 - 230	21	139
388		1345	1525	26°54'	112°44'	26°48'	112°41'	224 - 228	27	178
389		1600	1740	26°48'	112°38'	26°42'	112°36'	305 - 310	17	112
390		1830	1850	26°42'	112°34'	26°41'	112°33'	356 - 360	3	99
391	12.9.79	0115	0220	26°00'	112°17'	25°56'	112°16'	312 - 322	-	-
392		0620	0800	25°26'	112°08'	25°20'	112°08'	360 - 364	11	73
393		0840	1020	25°17'	112°06'	25°11'	112°05'	462 - 464	1	7
394		1110	1250	25°09'	112°02'	25°02'	112°04'	502 - 513	-	-
395		1415	1555	24°58'	112°08'	24°52'	112°09'	404	2	13
396		1650	1800	24°50'	112°13'	24°45'	112°14'	356	4	38

Table 2 (continued)

Shot No.	Date	Set Time	Up Time	Setting Position Lat.	Setting Position Long.	Hauling Position Lat.	Hauling Position Long.	Depth Range (m)	Catch in Pans	Catch Rate
397	13.9.79	0600	0730	23°02'	113°18'	23°07'	113°16'	296 - 304	5	37
398		0810	0930	23°09'	113°11'	23°12'	113°10'	400 - 404	1	8
399		0935	1055	23°13'	113°06'	23°17'	113°03'	496 - 500	2	16
400		1145	1245	23°20'	113°04'	23°23'	113°02'	372 - 375	3	33
401		1325	1445	23°26'	113°03'	23°31'	113°00'	316 - 320	1	8
402		1530	1650	23°34'	113°03'	23°39'	113°00'	226 - 228	22	182
403		1735	1915	23°42'	113°01'	23°48'	112°58'	160 - 186	42	277
404	14.9.79	0145	0345	24°01'	112°40'	24°07'	112°35'	248 - 250	3	17
405		0430	0600	24°10'	112°33'	24°15'	112°30'	240	1	7
406		0635	0815	24°17'	112°28'	24°23'	112°25'	244	16	106
407		0900	1040	24°24'	112°24'	24°29'	112°21'	258 - 260	79	521
408		1120	1320	24°33'	112°21'	24°41'	112°18'	230 - 237	29	159
409		1430	1630	24°48'	112°15'	24°55'	112°14'	260 - 262	13	72
410		1720	1900	24°49'	112°14'	25°04'	112°13'	235 - 240	13	86
411	15.9.79	0120	0250	26°01'	112°32'	26°05'	112°36'	147 - 148	-	-
412		0325	0455	26°07'	112°37'	26°12'	112°41'	145 - 146	4	29
413		0540	0740	26°13'	112°42'	26°19'	112°48'	142 - 145	18	99
414		0810	1010	26°21'	112°51'	26°25'	112°58'	138	25	138
415		1045	1245	26°28'	112°56'	26°24'	112°49'	145 - 147	12	66
416		1320	1520	26°22'	112°50'	26°27'	112°57'	140 - 143	13	71
417		1550	1750	26°30'	113°00'	26°38'	113°00'	140 - 142	36	198
418	16.9.79	0200	0330	27°50'	113°10'	27°55'	113°12'	203	6	44
419		0410	0540	27°57'	113°12'	28°02'	113°14'	212 - 220	3	22
420		0620	0820	28°05'	113°14'	28°12'	113°19'	220 - 224	16	88
421		0800	1100	28°11'	113°20'	28°04'	113°16'	200 - 201	19	104
422		1140	1340	28°04'	113°17'	28°11'	113°21'	190	23	126
423		1415	1700	28°11'	113°21'	28°19'	113°25'	176 - 190	23	92
424		1730	1945	28°17'	113°25'	28°09'	113°22'	160 - 167	28	137

Table 3 Area and fishing block summaries of catch in tonnes, effort in trawl hours and catch per unit of effort in tonnes per hour from effective trawls by 'Taiyo Maru 71'

AREA 1	CATCH	EFFORT	EFFECTIVE TRAWLS	CPUE
919	5.65	16	10	.361
920	1.21	4	2	.309
928	18.02	80	45	.226
923	12.06	56	32	.217
927	1.65	9	4	.185
903	.58	4	1	.145
924	.13	1	2	.111
911	.19	2	1	.095
TOTAL	39.49	172	97	

AREA 2	CATCH	EFFORT	EFFECTIVE TRAWLS	CPUE
941	12.42	28	12	.436
931	19.98	51	24	.391
935	11.98	45	21	.269
932	2.29	15	8	.154
947	2.30	17	10	.132
TOTAL	48.97	156	75	

AREA 3	CATCH	EFFORT	EFFECTIVE TRAWLS	CPUE
820	1.55	3	2	.517
955	.79	2	1	.395
975	15.96	48	27	.333
970	13.76	46	23	.300
960	11.30	40	18	.280
964	8.18	30	13	.273
954	6.74	34	17	.198
965	1.36	7	3	.192
961	.97	6	3	.162
990	.36	2	2	.144
821	1.29	9	9	.139
989	1.28	15	12	.084
980	.32	4	4	.080
985	.54	8	7	.070
953	.45	7	3	.069
806	1.00	15	9	.068
802	.56	11	8	.053
810	.59	12	8	.051
816	.76	16	9	.049
969	.13	3	2	.043
811	.08	2	1	.040
815	.17	5	4	.032
984	.20	7	4	.029
TOTAL	68.34	332	189	

AREA 4	CATCH	EFFORT	EFFECTIVE TRAWLS	CPUE
838	2.55	6	6	.437
839	3.54	17	14	.202
825	4.75	29	18	.162
846	4.03	37	25	.110
826	1.09	11	10	.104
835	.64	8	7	.079
834	.04	1	2	.069
830	.71	15	11	.047
847	.20	6	6	.032
848	.08	3	4	.027
855	.04	4	4	.010
856	.03	4	7	.007
TOTAL	17.70	141	114	

Tuna	[illegible]		[illegible]	[illegible]														
[illegible]																		
[illegible]			[illegible]			[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]																		
[illegible]																		
[illegible]																		
[illegible]																		
[illegible]																		
[illegible]																		
[illegible]																		
[illegible]							3D	1D		1D	1D							
[illegible]			[illegible]	[illegible]			25D	1D	2D			1D	7D	3D	1D	2D		
[illegible]	[illegible]				[illegible]													
[illegible]												[illegible]	2	3			[illegible]	
[illegible]	5		3D					2			2				[illegible]	9D	1D	[illegible]
[illegible]																		
[illegible]																		
[illegible]						1D	12D	2D				3D	2D	1D	4D	1D	[illegible]	[illegible]
Red emperor									3D	4D	6D	3D	2D	6D	[illegible]	1D	2D	[illegible]
Black bream				1D					2	1	3D	1D						
Sweetlip emperor																		
[illegible]							3D		17	5	14	21	5	16	3	2	2	1	6
[illegible]	41	6	9	2														
Pelsen snapper						1					1	4	5	1	1	2	1	1	1
Pink snapper													1		1	6	2	1	
Mulloway																			
Goatfish		1					1		2		1	4	10	8	13	7	12		2
Deepwater bluefish																			
Queen snapper																			
Dusky morwong																			
Sea pike		6																	
Barracouta																			
Hairtail			1D																
Blue mackerel																			
Mixed fish (R)	1					1									1	1	2		1
Mixed fish (D)	2					3				3		2			1	2			1
Miscellaneous		4*			2D**														
Cuttlefish			3	1		6	1		3	2	3	7	6	6	6	4	8	6	3
Arrow squid, maroon																			
Arrow squid, orange																			
Roundfin squid																			

*Threadfin bream

**Brown Lined Sweetlip

Table 4 (cont'd)

LOGBOOK SHOT

COMMON NAME	A152	A153	A154	A155	A156	A157	A158	A159	A160	A161	A162	A163	A164	A165	A166	A167	A168	A169	A170
Shark					2D						1D			1D					
Spookfish									1D		1D				1D	1D	1D		
Lizard fish	9D	10D																	
Nannygai																			
Dory									5D		1D			2D		1D			
Veilfin																			
Gulf gurnard perch																			
Latchet																			
Flathead																			
Captains fish				40															
Rock cod											3D			1D					
Pearl perch		1D	1D	3D															
Bigeye	2		2		2														
Tailor																			
Trevally	4	3	10		1							10	1	6					
Amberjack																			
Scad		1																	
Chinaman fish		2D	9D		2D														
Red emperor	1			1D	1D														
Slate bream																			
Sweetlip emperor																			
Emperor	5			1															
Lenko snapper					10	249	150	143	61	94	87	100	92	29	17	50	4	78	98
False snapper	1	3																	
Pink snapper																			
Mulloway																			
Goatfish	4																		
Deepwater boarfish																			
Queen snapper																			
Dusky morwong																			
Sea pike																			
Barracouta																			
Hairtail																			
Blue mackerel																			
Mixed fish (R)	1				1		1		1										
Mixed fish (D)		2		3	1		1								1			2	
Miscellaneous																			
Cuttlefish	5	7		1															
Arrow squid, maroon																			
Arrow squid, orange											1				1				
Roundfin squid																			

Table 4 (cont'd)

COMMON NAME	LOGBOOK SHOT A171	A172	A173	A174	A175	A176	A177	A178	A179	A180	A181	A182	A183	A184	A185	A186	A187	A188
Shark																		
Spookfish						2D	5D					1D		4D	6D		1D	
Lizard fish																		
Nannygai																		
Dory												1D						
Veilfin																		
Gulf gurnard perch																		
Latchet																		
Flathead																		
Captains fish																		
Rock cod		1D	1D				1F						1F, 1D	3D	2F			2D
Pearl perch																		
Bigeye														1D	1D			
Tailor																		
Trevally																		
Amberjack		1D	5	4	2													
Scad																		
Chinaman fish								2										
Red emperor		1D		1D														
Slate bream													3D			1D		6D
Sweetlip empefor																		
Emperor																		
Lenko snapper	110	37	79	52	28	3	1		325	702	276	7	352	123	2		1	4
False snapper																		
Pink snapper		4	8									1	2	21D	1D			3D
Mulloway																		
Goatfish																		
Deepwater boarfish																		
Queen snapper																		
Dusky morwong																		
Sea pike	3																	
Barracouta																		
Hairtail																		
Blue mackerel																		
Mixed fish (R)															2			
Mixed fish (D)				2			2								2	1		
Miscellaneous						1D*												
Cuttlefish																5D**		
Arrow squid, maroon								2										
Arrow squid, orange	1			1														1
Roundfin squid																		

*Spanish mackerel

**Scarlet sea perch

Table 4 (cont'd)

LOGBOOK SHOT

COMMON NAME	A189	A190	A191	1	2	3	4	5	6	7	8	9	10	11	12	13	15	16	17
Shark			1D					2D	2D					12D					
Spookfish																			
Lizard fish																			
Nannygai	2D	6D	2D	3D	2D	1D	5D	4D	9D		29D			5D	3D		17D		
Dory																			
Veilfin						6D		10D	10D	19D	1D			1D					
Gulf gurnard perch																			
Latchet																			
Flathead																			
Captains fish	11D	6D	2D																
Rock cod		1F	1D		1F, 1D	1D													
Pearl perch	1D	1D																	
Bigeye	2						1			1							6		
Tailor																			
Trevally	2	1	8	1D	1D														
Amberjack																			
Scad			3D						18	45	11		1				4D, 65	81	37
Chinaman fish	1D	2D																	
Red emperor																			
Slate bream																			
Sweetlip emperor																			
Emperor																			
Lenko snapper	15	17	76		1	2	1		6	2	1		2	4	4	5	6	12	6
False snapper																			
Pink snapper	3	5	1D, 3	3		1	1	3	6		2			1	2		7	1	2
Mulloway																			
Goatfish						1	1										4	5	2
Deepwater boarfish																			
Queen snapper																			
Dusky morwong																			
Sea pike			5						1D, 109	7D, 37	5D, 62	118	178	6D, 1			1D, 20	1D, 6	5D, 68
Barracouta																			
Hairtail																			
Blue mackerel																			
Mixed fish (R)			2							1	1		1	1				1	
Mixed fish (D)			2											2					
Miscellaneous																			
Cuttlefish			1			1	1	2			2					2	2		
Arrow squid, maroon							1												
Arrow squid, orange			1							2					1				
Roundfin squid																			

Table 4 (cont'd)

COMMON NAME	LOGBOOK SHOT 18	19	20	21	22	23	24	25	26	27	28	30	31	32	34	35	36	37	38	39
Shark					1D	1D														
Spookfish														2D						
Lizard fish																				
Nannygai	5D		1D					16D	1D			2D	30D	10D	3D	2D				
Dory																				
Veilfin				2D			1D		6D	1D		1D		3D					1D	
Gulf gurnard perch																				
Latchet																				
Flathead																				
Capelins fish																1D				
Rock cod																				
Pearl perch														1						1
Bigeye						2														
Tailor													1					1		
Trevally																				
Amberjack																				
Scad	60D,19				17	2	8	20				65		14						
Chinaman fish																				
Red emperor																				
Slate cream																				
Sweetlip emperor																				
Emperor																				
Lerro snapper	18	5	2	1	1	6	2	9				36	4	4						
False snapper																				
Pink snapper	6			2	2		3	10		1	1	4	3	4				2		
Mulloway				1D																
Goatfish													1	2						
Deepwater goatfish																				
Queen snapper																				
Dusky morwong																				
Sea pike	34		1		9D,127	3D,40	7D,62	4D,100				5	1	1D,48						
Barracouta																				
Hairtail																				
Blue mackerel	4D																			
Mixed fish (R)		1				1			3					1						
Mixed fish (D)		3	2						1			2	1	2			1			
Miscellaneous						2D*														
Cuttlefish			2		2				6	5	6	4		1	1	3		2	2	
Arrow squid, maroon					2	1			1											
Arrow squid, orange														2		2	1		1	1
Roundfin squid				4					2	2	1			1	1		1	1	1	1

*Knifejaw

Table 4 (cont'd)

LOGBOOK SHOT

COMMON NAME	41	42	44	45	46	47.	48	49	51	52	53	54	55·	56	57	58	60
Shark																	
Spookfish																	
Lizard fish																	
Nannygai		1D			4D			1D				3D		1D			1D
Dory						3											
Veilfin		4D															
Gulf gurnard perch	2D	1D	1D	2D			2D	2D		2D	1D	9D	9D		1D	1D	
Latchet																	
Flathead					1D					1D							
Captains fish																	
Rock cod																	
Pearl perch																	
Bigeye	3	3															
Tailor																	
Trevally																	
Amberjack																	
Scad									22		46	54	63	62	7		
Chinaman fish																	
Red emperor																	
Slate bream																	
Sweetlip emperor																	
Emperor																	
Lenko snapper																	
False snapper																	
Pink snapper	2	1															
Mulloway										1F							
Goatfish							8										
Deepwater goatfish																	
Queen snapper																	
Dusky morwong																	
Sea pike																	
Barracouta																	
Hairtail																	
Blue mackerel																	
Mixed fish (S)		1															
Mixed fish (D)		2			1											1	1
Miscellaneous																	
Cuttlefish	1	2	2					1								1	
Arrow squid, maroon										1				1			
Arrow squid, orange		1		1													
Roundfin squid	1			1						2						1	

Table 4 (cont'd)

COMMON NAME	LOGBOOK SHOT 61	62	63	64	65	66	67	68	69	70	71	73	74	75	76	78	79	80
Shark																		
Spookfish																		
Lizard fish																		
Nannygai						2D	2D	10D	1D		3D					1D		
Dory																		
Veilfin																		
Gulf gurnard perch	6D		1D								1D		6D	15D	1D	1D	2D	2D
Latchet			1D	2D		1D												
Flathead			1D	4D	2D					1D		1D	1D					
Captains fish																		
Rock cod			2F															
Pearl perch																		
Bigeye																		
Tailor																		
Trevally																		
Amberjack															4D			
Scad																		
Chinaman fish													1					
Red emperor																		
Slate bream																		
Sweetlip emperor																		
Emperor																		
Lenko snapper																		
False snapper																		
Pink snapper																		
Mulloway																		
Goatfish								1D										
Deepwater boarfish																		
Queen snapper																		
Dusky morwong						2D										1D		
Sea pike				1D														
Barracouta																		
Hairtail																		
Blue mackerel																		
Mixed fish (R)																		
Mixed fish (D)		1	2	1	1		2				2					6		
Miscellaneous																		
Cuttlefish									1			1				1D*		
Arrow squid, maroon																		
Arrow squid, orange					1							1						
Roundfin squid							1					1						

*knifejaw

Table 4 (cont'd)

LOGBOOK SHOT

COMMON NAME	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
Shark																			
Spookfish																			
Lizard fish																			
Nannygai																			9
Dory																			
Veilfin								5 D	36 D	1D			1D	4 D		1D	1D	7D	2D
Gulf gurnard perch		1D		3D	1D	2D	2D		1D	1D	2D		1D	2 D	1D	1D	1D		
Latchet					2D														
Flathead																			
Captains fish																			
Rock cod							1F									1D			
Pearl perch																			
Bigeye																			
Tailor																			
Trevally			1	1						1			1D	2 D				2	1
Amberjack														1 D					
Scad		37	13	15		8	2												
Chinaman fish																			
Red emperor																			
Slate bream																			
Sweetlip emperor																			
Emperor																			
Lenko snapper																			
False snapper																			
Pink snapper																			
Mulloway												1	1	1	1		2		4
Goatfish																			
Deepwater boarfish																			1
Queen snapper																			
Dusky morwong																			
Sea pike																			
Barracouta																			
Hairtail																			
Blue mackerel																			
Mixed fish (R)																			
Mixed fish (D)	2				2		2				2								
Miscellaneous	1*														1				1
Cuttlefish														2**					
Arrow squid, maroon											1	1		2	1		4		
Arrow squid, orange							1								1				
Roundfin squid	1								1						1				

* Squid mixed

** Threadfin bream

Table 4 (cont'd)

COMMON NAME	LOGBOOK SHOT 100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118
Shark								3D											
Spookfish																			
Lizard fish																			
Nannygai	17D	17D						1D				1D	1D				1D	4D	
Dory																			
Veilfin																			
Gulf gurnard perch																			
Latchet																			
Flathead																			
Captains fish	1D	1D														7D	11D	12D	
Rock cod	2D,1F			1F														1D	
Pearl perch																			
Bigeye								2		1	4	1	3			1	3	4	
Tailor																			
Trevally																			
Amberjack																			
Scad			1D	1D	1	1				2	15D,6	1D	2	1	9,25D	2D,30			
Chinaman fish																			
Red emperor																			
Slate bream																			
Sweetlip emperor																			
Emperor																			
Lenko snapper		2	12	9	21	2	3	15	9	31	50	10	7	12	20	59	112	115	23
False snapper																			
Pink snapper	3	4	1				2	1	2	1	4	3	7	2	2		5	5	3
Mulloway																			
Goatfish		3		1	3	2		1		2	12	1	1		4	4	15	8	
Deepwater boarfish																			
Queen snapper																			
Dusky morwong																			
Sea pike		38	141	1D				8	28	23	1D,18								
Barracouta																			
Hairtail																			
Blue mackerel															1				
Mixed fish (R)																			
Mixed fish (D)	1			2	1							1			2	1	1	1	
Miscellaneous																			
Cuttlefish							1			1		1							
Arrow squid, maroon																			
Arrow squid, orange									1										
Roundfin squid																			

Table 4 (cont'd)

LOGBOOK SHOT

COMMON NAME	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137
Shark																	2D		
Spookfish																			
Lizard fish																			
Nannygai				5D	4D	4D	4D										1D		
Dory																			
Veilfin																			
Gulf gurnard perch																			
Latchet																			
Flathead																			
Captains fish					7D	10D	1D						1D					38D	
Rock cod				1F	1F	1D		1F				1D							
Pearl perch													5D					1D	
Bigeye					2	1							5D						
Tailor																			
Trevally													46					31	31
Amberjack																			
Scad						2D	11D,6						3D	3D					
Chinaman fish													2D		2D			9D	
Red emperor																			
Slate bream																			
Sweetlip emperor																			
Emperor																			
Lenko snapper	12	10	16	30	87	30	128	53				1	3	1		6	1	1	
False snapper																			
Pink snapper		2		12	4	3	4	2	2	3	4	1	8		1			1D,2	
Mulloway																			
Goatfish			1		8	9	28	8											
Deepwater boarfish																			
Queen snapper																			
Dusky morwong																			
Sea pike							1D												
Barracouta																			
Hairtail																			
Blue mackerel																			
Mixed fish (R)								3			1								
Mixed fish (D)				1	1		2	2		2					1		1	1	
Miscellaneous																			
Cuttlefish														1	1		1	1	
Arrow squid, maroon																			
Arrow squid, orange																			
Roundfin squid																			

Table 4 (cont'd)

COMMON NAME	LOGBOOK SHOT 138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156
Shark																			
Spookfish																			
Lizard fish																			
Nannygai																			
Dory																			
Veilfin																			
Gulf gurnard perch																			
Latchet																			
Flathead																			
Captains fish																			
Rock cod																			
Pearl perch	4			10D				4D	3D	2D	1D				1D	3D	8D	3D	
Bigeye		8	1	1	1	3	12	4			1	1	2	1	1		1		
Tailor		1D								1D									
Trevally	9	39	2	2	2	2	9	32	1D, 3	2	31	8		1	2				
Amberjack																			
Scad		17	1	1		7	14	1D, 1				1		1	1				4
Chinaman fish	8		6D	4D	11D	1D			1D			1D			1D	1D	1D		
Red emperor			2D	2D	3D		2D	1D	2D	1D		2D	1D	1D	1D	6D	7D	6D	1D
Slate bream																		2D	
Sweetlip emperor		2D	5D	7D	8D	6D	3D	5D	5D	7D			1D	1D	3D	13D	49D	8D	6D
Emperor																			
Lenko snapper	1																		
False snapper	1		1	9	3	3	3	1	2	1			1	1	3	6	3		2
Pink snapper	2	6		2	2	1	1	1	2		2	3	4				1		
Mulloway																			
Goatfish	1	7	3	1	2	4	5	7	5	7	5	3	1	2	4	4	5	5	3
Deepwater bearfish																			
Queen snapper																			
Dusky morwong																			
Sea pike																			
Barracouta																			
Hairtail																			
Blue mackerel																			
Mixed fish (R)			2											1					
Mixed fish (D)	1	1		1	2		1			1				1	1	1			
Miscellaneous																			
Cuttlefish	2	5	3	5	5	8	6	4	3	3	4	4	5	4	3	5	4	5	1
Arrow squid, maroon																			
Arrow squid, orange																			
Roundfin squid																			

Table 4 (cont'd)

LOGBOOK SHOT

COMMON NAME	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
Shark																			
Spookfish																			
Lizard fish																			
Nannygai																			
Dory																			
Veilfin																			
Gulf gurnard perch																			
Latchet																			
Flathead																			
Captains fish																			
Rock cod								1D								2D			1D
Pearl perch	3D	8D	2D					9D	4D					1				8	3
Bigeye		1	1	1	1	1				1						1		4	1
Tailor																			
Trevally		1			1				16						2D	25			3D
Amberjack																			2D
Scad									1							1			1D,6S
Chinaman fish	1D	1D							2D		1D		1D	1D			1D	6D	5D
Red emperor	3D	4D	3D	1D				5D	6D		5D	4D	2D	2D		1D		1D	2D
Slate bream								1D	1D		5D	2D	1D						
Sweetlip emperor	10D	5D	5D	2D		2D		1D	11D	5D	10D	6D	7D	2D	1D	14D	7D	10D	22D
Emperor																			
Lenko snapper																			
False snapper		3	1	1		3		6	5	1			1	2	18	5			
Pink snapper			1					4	3										
Mulloway																			
Goatfish	10	9	2	1	3					1	1		1			6		5	6
Deepwater boarfish																			
Queen snapper																			
Dusky morwong																			
Sea pike																			
Barracouta																			
Hairtail																			
Blue mackerel																			
Mixed fish (R)	1					5												1	
Mixed fish (D)	4			2		1				1						2	3	2	
Miscellaneous																			
Cuttlefish	3	4	1	6	5	6	2	2	4	1	2		1	5	3	4		6	3
Arrow squid, maroon																			
Arrow squid, orange																			
Roundfin squid																			

Table 4 (cont'd)

LOGBOOK SHOT

COMMON NAME	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194
Shark																			
Spookfish																			
Lizard fish																			
Nannygai																			
Dory																			
Veilfin																			
Gulf gurnard perch																			
Latchet																			
Flathead																			
Captains fish																			
Rock cod						1	2		2				1			1	1	1	
Pearl perch		1		6	1	2	3	1	5	2			1	1	2	1	3	2	2
Bigeye		1	1		1	3		2		8	79	2	5		1	1	2		1
Tailor																			
Trevally		1				7D	11D	4D	1D	1D	1D	1D				2D	3D	2D	1D
Amberjack						1D	1D	1D	9D	1D									
Scad	1D	1D,1				1D,20													2
Chinaman fish			2D	13D	1D	7D	14D	2D	34D	8D	51D	12D	1D	11D	9D	8D	12D	9D	2D
Red emperor				4D	1D	2D	2D	2D	2D	3D		1D	2D	3D		1D		1D	4D
Slate bream																			
Sweetlip emperor	1D		9D	20D	5D	19D	34D	24D	18D	33D	27D	10D	9D	14D	5D	12D	15D	21D	27D
Emperor																			
Lenko snapper																			
False snapper	2	1	2	6	3									2					1
Pink snapper																			
Mulloway									5					1					
Goatfish			1	1	2	6	18	15	4	9	5	3			1	7	6	9	16
Deepwater boarfish																			
Queen snapper																			
Dusky morwong																			
Sea pike																			
Barracouta																1D			
Hairtail																			
Blue mackerel																			
Mixed fish (R)							1												
Mixed fish (D)		3	1			1	1			2									
Miscellaneous					1D*									1D*			1D*	1	2
Cuttlefish	6	5	5	6	6	2	3	2		5	2	2	3	5	4	6	5		3
Arrow squid, maroon																			
Arrow squid, orange																			
Roundfin squid																			

* purple bream

*Purple bream

Table 4 (cont'd)

COMMON NAME	LOGBOOK SHOT 195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213
Shark																			
Spookfish																			
Lizard fish																			
Nannygai														1D	2D				
Dory																			
Veilfin																			
Gulf gurnard perch																			
Latchet																			
Flathead																			
Captains fish						2D											36	6	
Rock cod										1D					2D		1D	1D	
Pearl perch	4		1			9D				2D			2D				19	15	3
Bigeye	25	21	1			4		1			1								
Tailor																			
Trevally	3D		1D			7	81	32	19	38	4				2		5	5	2
Amberjack															22D	1D			
Scad	5					1	2			1									8
Chinaman fish	7D			1D	4D	8D				2D			12D	3D			6D	4D	1D
Red emperor	6D		2D					1D											
Slate bream																			
Sweetlip emperor	33D	16D	1D																
Emperor																			
Lenko snapper														15	2	5		3	
False snapper	2	2	1	2		3		3		2	1								
Pink snapper								1		1			4		38	1	13	8	
Mulloway																			
Goatfish	22	7	1						3		1								
Deepwater boarfish																			
Queen snapper																			
Dusky morwong																			
Sea pike	7D								23	1									1D
Barracouta																			
Hairtail																		1D	
Blue mackerel																			
Mixed fish (R)														1					
Mixed fish (D)			1				2				1	2		1		1			2
Miscellaneous						6D**													
Cuttlefish	4	3	7	2	3	4		3	3	4	5	1		3					
Arrow squid, maroon																			
Arrow squid, orange																			
Roundfin squid																			

** Spotted boarfish

Table 4 (cont'd)

COMMON NAME	LOGBOOK SHOT 215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232
Shark																		
Spookfish				1D	2D													
Lizard fish																		
Nannygai	2D								2D									
Dory				2D														
Veilfin																		
Gulf gurnard perch																		
Latchet																		
Flathead																		
Captains fish																		
Rock cod																		
Pearl perch																		
Bigeye	5	1	1							1				1				
Tailor											1D			1				
Trevally									1	10	15	1	6	23	1			
Amberjack										7D,102	1D,18		4	5D,13	1D,2			
Scad																		
Chinaman fish																		
Red emperor																		
Slate bream																		
Sweetlip emperor																		
Emperor																		
Lenko snapper						3	2	4	8	49	17	15	35	20	12	8	3	2
False snapper																		
Pink snapper	5	1						1	2									
Mulloway																		
Goatfish								2	3	4	3			3	1	1	1	
Deepwater boarfish																		
Queen snapper																		
Dusky morwong																		
Sea pike											1D,38	1		5				
Barracouta																		
Hairtail																		
Blue mackerel																		
Mixed fish (R)						1					1				1			
Mixed fish (D)		2			2							2			1			
Miscellaneous																		
Cuttlefish		1				4	6	4	5		8	1	4	2	3	1	6	5
Arrow squid, maroon																		
Arrow squid, orange				1														
Roundfin squid																		

Table 4 (cont'd)

LOGBOOK SHOT

COMMON NAME	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251
Shark																			
Spookfish								1D	1D	1D							1D	10D	1D
Lizard fish																			
Nannygai		1D					1D					2D	2D	3D		1D			
Dory									2D	13D						1D	21D	11D	3D
Veilfin													1						
Gulf gurnard perch		1D	2D	1D															
Latchet																			
Flathead																1D			
Captains fish	1D																		
Rock cod															1F				
Pearl perch																			
Bigeye	1				1								1						
Tailor	1D																		
Trevally	9	10	4D																
Amberjack	1D	3D	1D	1D								9D	1D						
Scad	22	2			4D	1D													
Chinaman fish	7D																		
Red emperor																			
Slate bream																			
Sweetlip emperor				5D															
Emperor																			
Lenko snapper	2	1			25	4													
False snapper																			
Pink snapper	6	26	11	7	1							9	8		1				
Mulloway																			
Goatfish	10	1	2	4	2							1							
Deepwater boarfish																		2D	
Queen snapper																			
Dusky morwong																			
Sea pike	6				3														
Barracouta											1D						2D		
Hairtail																			
Blue mackerel																			
Mixed fish (R)					2								1						
Mixed fish (D)	1		1	1	4	2		1				1	3	1					
Miscellaneous											1D*								
Cuttlefish	5		1	3	2										1				
Arrow squid, maroon																			
Arrow squid, orange										4									
Roundfin squid																			

* Cubehead

Table 4 (cont'd)

LOGBOOK SHOT

COMMON NAME	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268
Shark																	
Spookfish																	
Lizard fish																	
Nannygai																	
Dory	1D																
Veilfin						1D											
Gulf gurnard perch			1	1D	6D	12D	6D	6D	4D	1D	1D				3D	2D	5D
Latchet																	
Flathead														1D			1D
Captains fish																	
Rock cod										1D							
Pearl perch																	
Bigeye																	
Tailor																	
Trevally									1			1		3	2	2	3
Amberjack																	
Scad									15			1	3	10	1		6
Chinaman fish																	
Red emperor																	
Slate bream																	
Sweetlip emperor																	
Emperor																	
Lenko snapper																	
False snapper																	
Pink snapper																	
Mulloway																	
Goatfish				2F,10D	4F,7D	1				1D			1F				
Deepwater boarfish																	
Queen snapper																	
Dusky morwong																	
Sea pike																	
Barracouta		1D															
Hairtail																	
Blue mackerel																	
Mixed fish (R)																	
Mixed fish (D)		3	1					1			1	2			1		
Miscellaneous																	
Cuttlefish					1						1		1				
Arrow squid, maroon																	
Arrow squid, orange			1				1			1							
Roundfin squid			1		2	1	1			1	1			3	2		

Table 4 (cont'd)

LOGBOOK SHOT

COMMON NAME	269	270	272	273	275	276	279	280	281	282	284	286	287	288	289	290	291	292
Shark																		
Spookfish									1D	1D	2D			2D			1D	
Lizard fish															9D	1D	1D	
Nannygai																		
Dory								4D	5D		1D	10D	1D	8D	6D	2D	4D	3D
Veilfin																		
Gulf gurnard perch	1D	1D																
Latchet																		
Flathead										1D								
Captains fish																		
Rock cod																		
Pearl perch					5D													
Bigeye																		
Tailor																		
Trevally	7	1																
Amberjack																		
Scad			9	16		33												
Chinaman fish																		
Red emperor																		
Slate bream																		
Sweetlip emperor																		
Emperor																		
Lenko snapper																		
False snapper																		
Pink snapper																		
Mulloway																		
Goatfish																		
Deepwater boarfish							9D	102D	80D	6D		82D	2D	15D	13D	1D	50D	1D
Queen snapper																		
Dusky morwong																		
Sea pike																		
Barracouta													1D					
Hairtail								1D				2D						
Blue mackerel																		
Mixed fish (R)																		
Mixed fish (D)		3											2					
Miscellaneous		1F*																
Cuttlefish					2	3												
Arrow squid, maroon						2												
Arrow squid, orange								1	1			1	2				1	
Roundfin squid																		

*Mixed fish fillets

Table 4 (cont'd)

COMMON NAME	LOGBOOK SHOT 293	294	295	296	300	301	303	306	309	311	312	313	314	315	316	317	318	319
Shark																		
Spookfish	2D	1D		2D														
Lizard fish																		
Nannygai			1D							1D	2D	3D	2D	1D	2D	1D		1D
Dory	2D	1D	3D	2D														
Veilfin																		
Gulf gurnard perch																		
Latchet		1	1													2D	1D	
Flathead		2D	4D															
Captains fish																		
Rock cod																1D		
Pearl perch																		
Bigeye																		
Tailor																		
Trevally									1D									
Amberjack																		
Scad																		
Chinaman fish																1		
Red emperor																		
Slate bream																		
Sweetlip emperor																		
Emperor																		
Lenko snapper																		
False snapper																		
Pink snapper						1												
Mulloway																		
Goatfish																		
Deepwater boarfish	11D	2D	38D	3D														
Queen snapper																		
Dusky morwong																	1D	
Sea pike																		
Barracouta		1D																
Hairtail																		
Blue mackerel																		
Mixed fish (R)																		
Mixed fish (D)		1		2	2	2	1	1			1		1				1	1
Miscellaneous						1F*			1D**									
Cuttlefish						1												
Arrow squid, maroon														1				
Arrow squid, orange	2	1	4	1								1			1		1	
Roundfin squid												1						

*Mixed fish fillets

**Knifejaw

Table 4 (cont'd)

COMMON NAME	LOGBOOK SHOT 320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337
Shark																		
Spookfish												2D						
Lizard fish																		
Nannygai				4D	4D	3D	3D	3D					4D	1D			1D	
Dory									4D	6D		4D						
Veilfin																		
Gulf gurnard perch		4D	3D	3D	1D	1D							7D	3D	1D		1D	1D
Latchet		1D			11D													
Flathead									2D			9D	1D		1D	1D		2D
Captains fish																		
Rock cod																		1F
Pearl perch																		
Bigeye																		
Tailor																		
Trevally																		
Amberjack																		
Scad				8D					8D	1D								24
Chinaman fish																		
Red emperor																		
Slate bream																		
Sweetlip emperor																		
Emperor																		
Lenko snapper																		
False snapper																		
Pink snapper																		
Mulloway																		
Goatfish																		
Deepwater boarfish									27D	68D	10D	95D						
Queen snapper	1D	3D	2D	3D	16D													
Dusky morwong																		
Sea pike																		
Barracouta							1D			2D		5D						
Hairtail										1D		2D						
Blue mackerel																		
Mixed fish (R)																		
Mixed fish (D)		2					1	1	2			2					1	
Miscellaneous																		
Cuttlefish																1	1	
Arrow squid, maroon																		
Arrow squid, orange				2		1		1	9	7		2	8	2				
Roundfin squid				1			1											

Table 4 (cont'd)

LOGBOOK SHOT

COMMON NAME	138	139	140	142	143	144	145	146	147	148	149	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Shark																		
Spookfish			[illegible]	[illegible]			[illegible]		[illegible]	[illegible]								
Lizard fish																		
[illegible]																		
Dory							[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	
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Table 4 (cont'd)

COMMON NAME	LOGBOOK SHOT 361	362	363	364	366	367	368	370	371	372	373	374	375	378	379	380
Shark														1 D		
Spookfish	1D	2D		1D		1D										
Lizard fish																
Nannygai								1D	2D					4D		
Dory	3D	1D	1D	2D												
Veilfin							28D	1D		23D	18D	7D	2D	3D		
Gulf gurnard perch						1D	2D			1D	2D	1D	1D			
Latchet			1D		1D											
Flathead			1D			1D										
Captains fish																
Rock cod										1D		1D				
Pearl perch																
Bigeye																
Tailor																
Trevally														1	3	
Amberjack														1D	1D	
Scad																3D,114
Chinaman fish																
Red emperor																
Slate bream																
Sweetlip emperor																
Emperor																
Lonko snapper															3	4
False snapper																
Pink snapper						1				1					2	2
Mulloway																
Goatfish																
Deepwater boarfish	3D	7D	1D													
Queen snapper																
Dusky morwong																
Sea pike														2	28	13
Barracouta																
Sardinia																
Blue mackerel																
Mixed fish (R)												1				
Mixed fish (M)						1	2		1				2			1
Miscellaneous																
Cuttlefish						1			2	1		1	1			
Arrow squid, maroon																
Arrow squid, orange	1		1	1			1				1					
Southern squid						1				1	1					

Table 4 (cont'd)

COMMON NAME	LOGBOOK SHOT 381	382	383	384	385	386	387	388	389	390	392	393	395	396	397	398	399	400
Shark																		
Spookfish									1D		1D		1D	2D	1D	1D	1D	1D
Lizard fish																		
Nannygai			1D															
Dory									2D	2D	6D	1D	1D	1D			1D	1D
Veilfin																		
Gulf gurnard perch																		
Latchet																		
Flathead																		
Captains fish																		
Rock cod																		
Pearl perch																		
Bigeye		1	1															
Tailor																		
Trevally																		
Amberjack					6D													
Scad	2D,407	10				5												
Chinaman fish																		
Red emperor																		
Slate bream																		
Sweetlip emperor																		
Emperor																		
Lenko snapper	38	61	19	5	11	46	20	22	9									
False snapper																		
Pink snapper	4	4			6	2		2										
Mulloway																		
Goatfish			1	1		4	1	3										
Deepwater boarfish																		
Queen snapper											2D							1D
Dusky morwong																		
Sea pike	2D,18				6													
Barracouta									5		2D							
Hairtail																		
Blue mackerel																		
Mixed fish (R)			1															
Mixed fish (D)										1				1				
Miscellaneous						2*												
Cuttlefish				1														
Arrow squid, maroon																		
Arrow squid, orange																		
Roundfin squid				1														

*Threadfin bream

Table 4 (cont'd)

COMMON NAME	LOGBOOK SHOT 401	402	403	404	405	406	407	408	409	410	412	413	414	415	416	417	418	419
Shark					1D													
Spookfish																		
Lizard fish																		
Nannygai													3D				1D	1D
Dory		1D						1D		1D								
Veilfin																		
Gulf gurnard perch																		
Latchet																		
Flathead																		
Captains fish																		
Rock cod								1D		1D								
Pearl perch																		
Bigeye		2					1			1			2		2	1		
Tailor																		
Trevally			37	2			5		1			5	2	2	1	3		
Amberjack									1D									
Scad			3	1								1	1	1	2	3		
Chinaman fish																		
Red emperor																		
Slate bream																		
Sweetlip emperor																		
Emperor																		
Lenko snapper	1					11	71	19	5	5	1	5	12	6	4	21	2	1
False snapper																		
Pink snapper							2	7	6				1		1	3	1	
Mulloway																		
Goatfish													1		1			
Deepwater boarfish																		
Queen snapper																		
Dusky morwong																		
Sea pike		19	2			4				1								
Barracouta																		
Hairtail								1D										
Blue mackerel																		
Mixed fish (R)														1		1		
Mixed fish (D)						1				4			1				1	1
Miscellaneous																	1*	
Cuttlefish											3	7	2	2	2	4		
Arrow squid, maroon																		
Arrow squid, orange																		
Roundfin squid																		

*Rosy jobfish

Table 4 (cont'd)

LOGBOOK SHOT

	420	421	422	423	424		TOTALS
Shark							54
Spookfish							58
Lizard fish							103
Nannygai		7D	9D	3D			355
Dory							195
Veilfin		1D	7D	3D	15D		239
Gulf gurnard perch							178
Latchet							32
Flathead							55
Captains fish							195
Rock cod							67
Pearl perch							232
Bigeye							313
Tailor							6
Trevally				1D			1,047
Amberjack							65
Scad					1D		1,980
Chinaman fish							374
Red emperor							149
Slate bream							20
Sweetlip emperor							607
Emperor							101
Lenko snapper	3	3		3			5,209
False snapper							141
Pink snapper	12	6	6	8	3		503
Mulloway							29
Goatfish							507
Deepwater boarfish							812
Queen snapper							29
Dusky morwong							1
Sea pike		2					1,518
Barracouta							21
Hairtail							9
Blue mackerel							5
Mixed fish (R)				1			53
Mixed fish (D)				3	3		240
Miscellaneous							34
Cuttlefish				1	4		505
Arrow squid, maroon							11
Arrow squid, orange	1		1				95
Roundfin squid					2		47

GRAND TOTAL: 16,194

Table 5 The variation in count of fish per pan and net weight per pan for some commercial fish species.

Species	Condition	Fish count per pan Net pan weight (kg)										Average Number Per Pan	Net Average Weight
Lenko Snapper	W	51 10.5	60 10.6	68 11.7	91 10.5	94 10.9	96 10.7	100 10.8	100 10.8			82	~ 10.9
Yellowtail Scad	W	112 10.5	115 11.1	122 11.2	141 12.3	141 12.6						126	11.6
Jack Mackerel	W	36 10.5	37 <10.0	38 <10.5	340+ 11.7	340+ 11.8	340+ 11.8	340+ 11.9	340+ 12.0	340+ 12.7		-	~ 11.5
Jack Mackerel	H.G.	46 11.4	47 10.9	51 10.6	55 10.8	59 10.7						52	10.9
Striped Sea Pike	W	40 10.5	45 10.7	50 10.9	63 11.9							50	11.0
Trevally	W	40 <10.5	42 <10.5	44 11.4	46 10.7	50 11.1	50 11.4	50 11.7	51 11.4	60 12.2		48	~ 11.2
White-Finned Cavalla	W	43 <10.5	51 10.8	63 11.0	64 11.0	64 12.0	70 12.7					59	~ 11.4
Big-Spined Boarfish	H.G	23 10.5	24 11.2	25 10.5	25 10.5	25 10.9	25 11.3	26 11.1	30 <10.5	31 10.5	32 11.3	27	~ 10.9
Pink Snapper	W	5 12.5	6 10.5	6 10.6	6 11.0	6 12.2	7 11.8	12 <10.5	14 10.8	18 11.4		9	~ 11.3
Nannygai	H.G.	29 11.0	29 12.0	35 10.9	38	39 10.8	43 11.5	61 11.0	64 11.4	11.3		44	11.2
Veilfin	H.G.	20 10.6	23 10.6	23 10.9	23 11.1	25 12.0	26 10.8	27 11.3	28 10.9	28 11.3	29 11.2	25	11.1
Gulf Gurnard perch	H.G.	47 <10.5	81 12.0	86 11.9	102 12.3							79	~ 11.7
McCulloch's Dory	H.G.T	10 <10.5	17 10.8	25 10.6								17	~ 10.7
Mirror Dory	H.G.T.	11 <10.5	13 <10.5	15 10.5	16 10.9	18 <10.5	20 11.2	24 10.6	26 11.1			18	~ 10.8
Mirror and McCullocks Dory	H.G.T.	11 10.6	11 11.1	12 11.4	13 11.9	15 11.8	16 11.1	21 11.0				14	11.3
Amberjack	H.G.T.	4 12.7	4 13.6	4 13.4	6 12.6	6 13.7						5	12.7

Figure 1 The approximate cruise track of 'Taiyo Maru 71' as indicated by daily mid-position (broken line, dates shown at about weekly intervals) during observer presence on board vessel 13 July - 16 September 1979. Depth contours in metres and 320 km (200 mile) western boundary of Australian Fishing Zone (A.F.Z.) are shown.

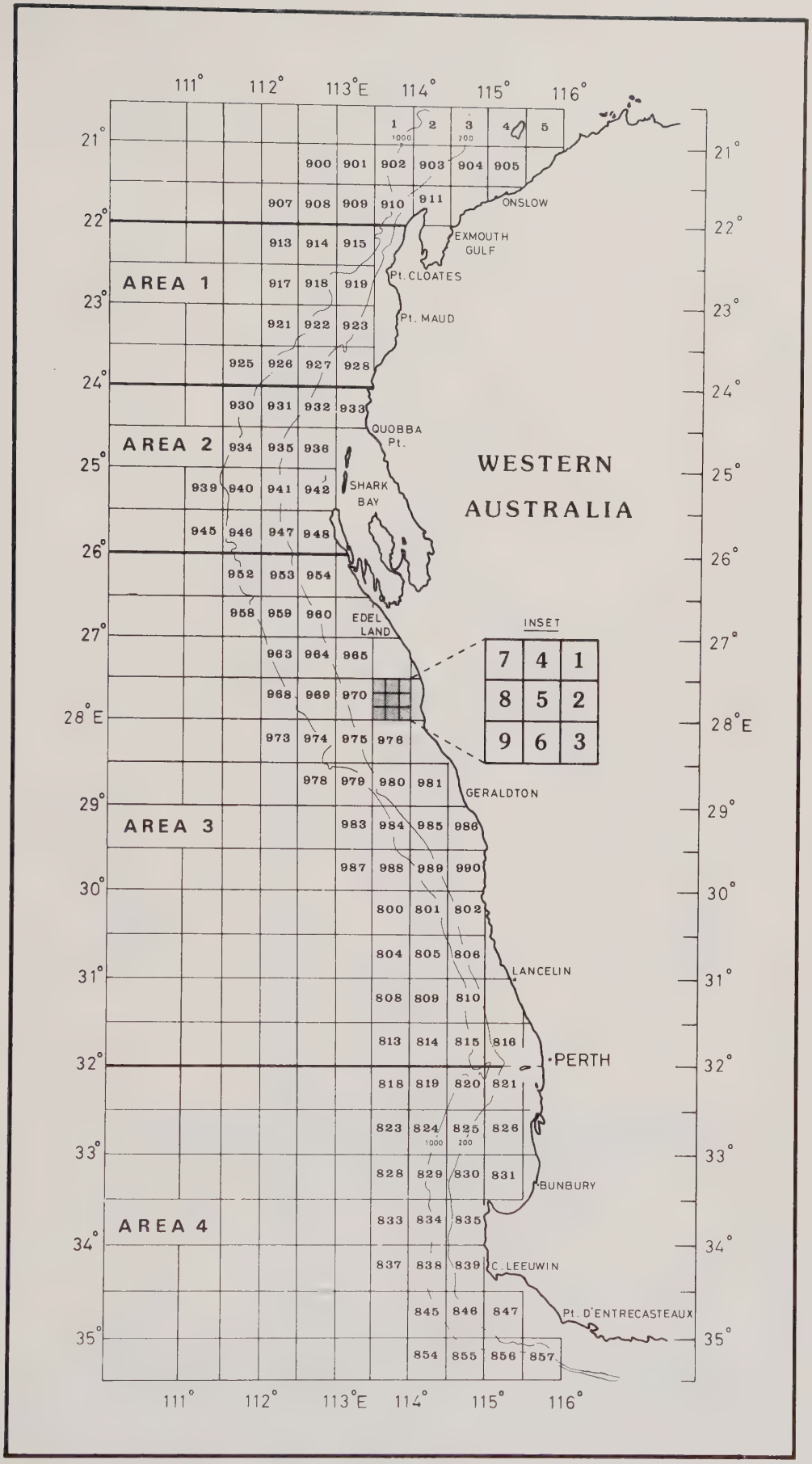


Figure 2 The Japanese numbering system for fishing blocks and sub-blocks along the Western Australian southern coastal zone. Block numbers for northern W.A. coastal zone shown in Appendix I figure. Conditions of trawling in Areas 1-4 are discussed in text introduction."

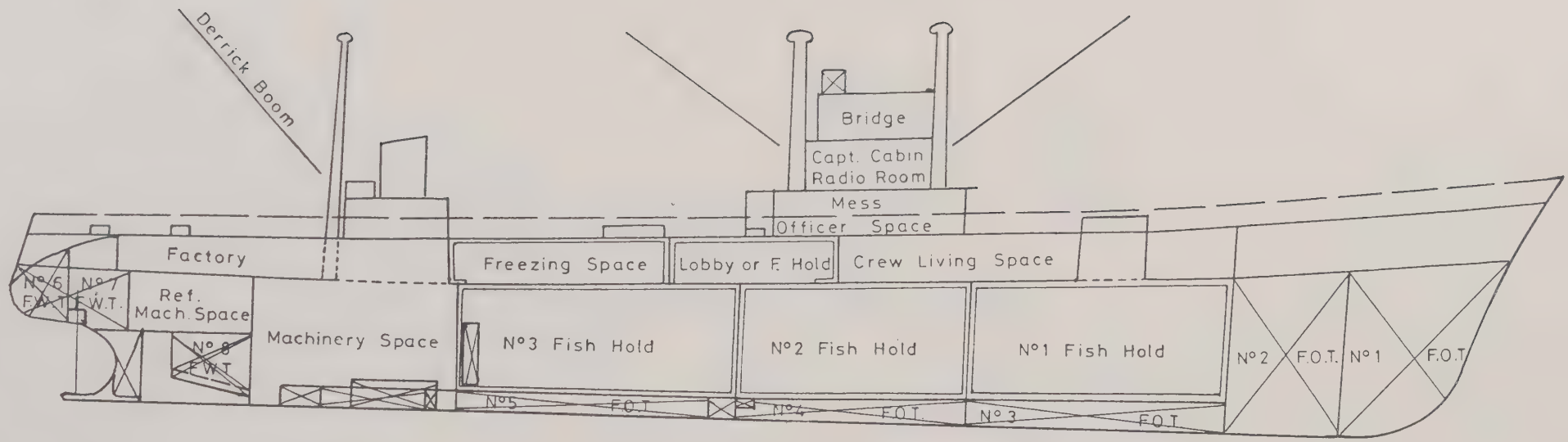


Figure 3 An elevation plan of 'Taiyo Maru 71' showing allocation of space in hull and superstructure.

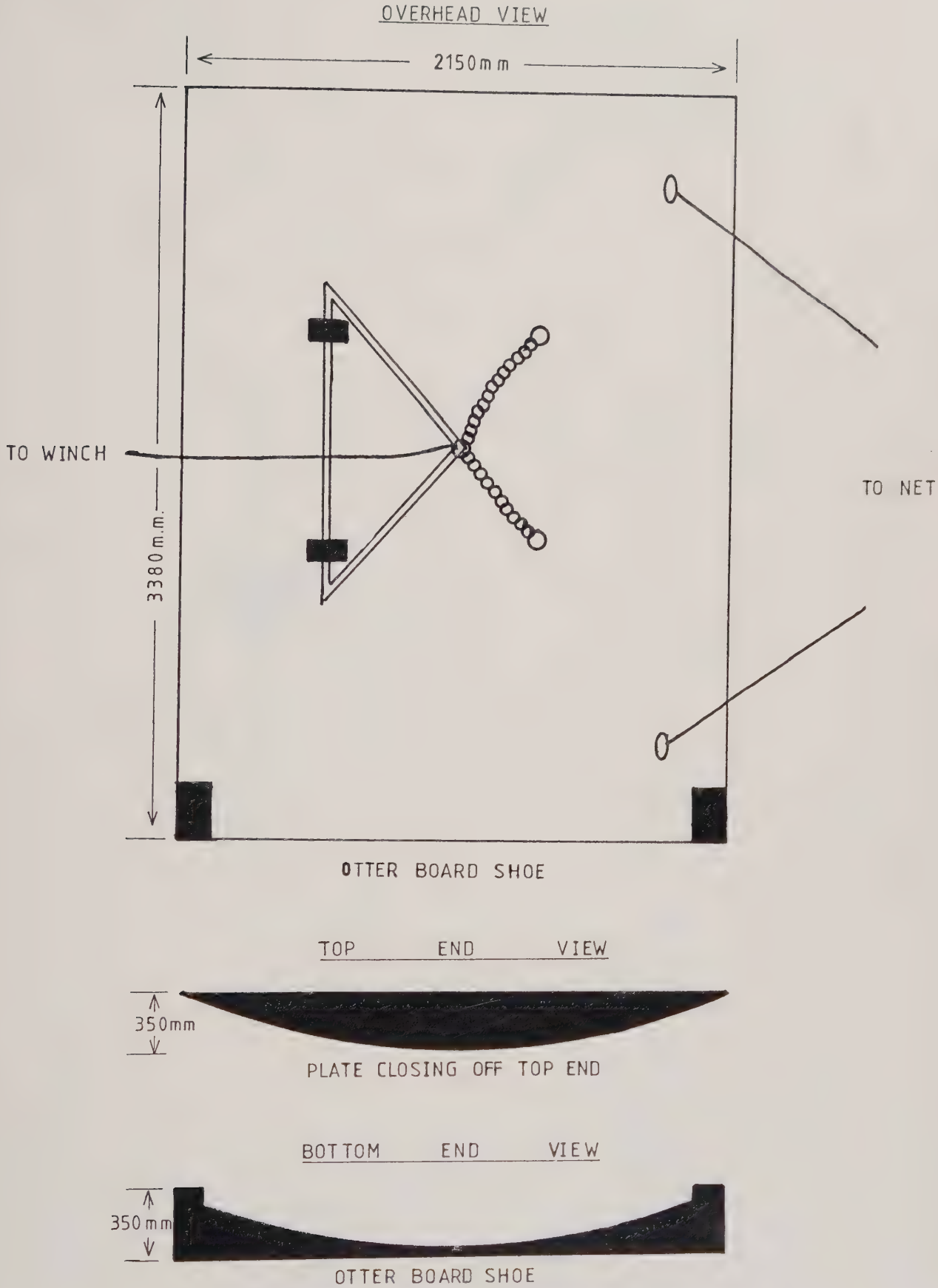


Figure 4 Details of construction of dished steel otter boards.

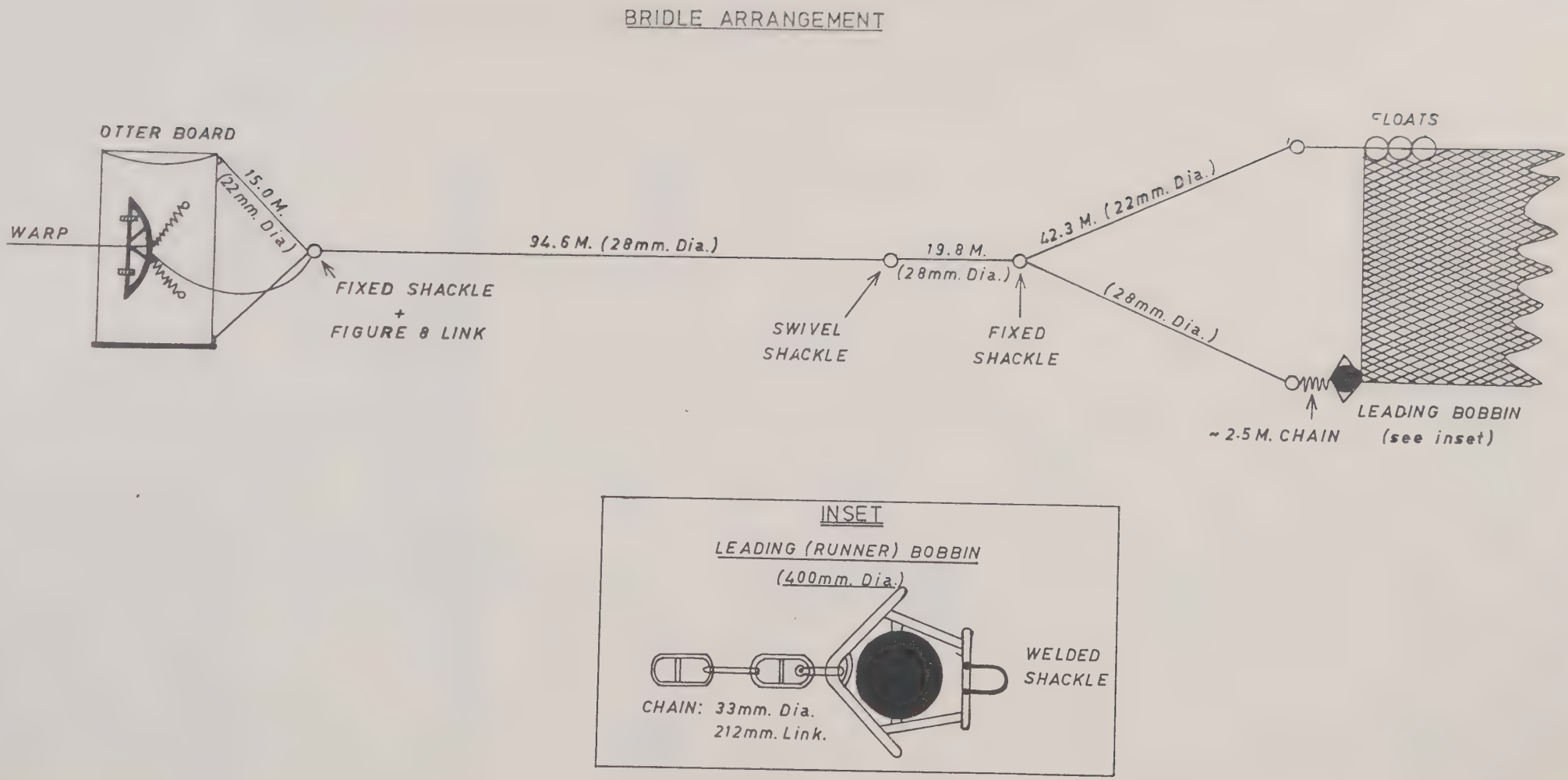


Figure 5 One of the bridle arrangements used during the exploratory trawling cruise.

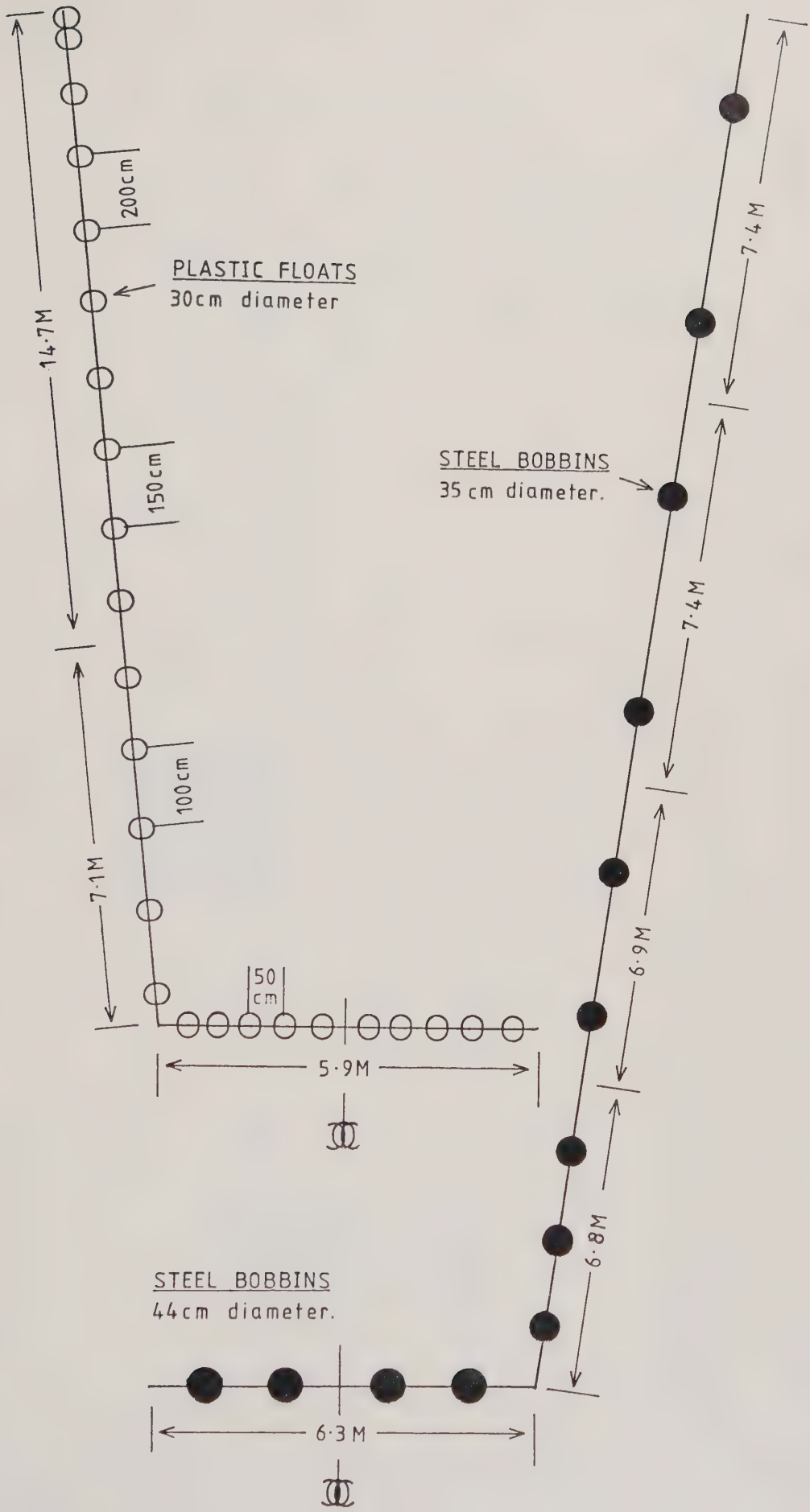


Figure 6 The ground rope and head rope designs used on net No. 1.

OTTER TRAWL FISHING NET

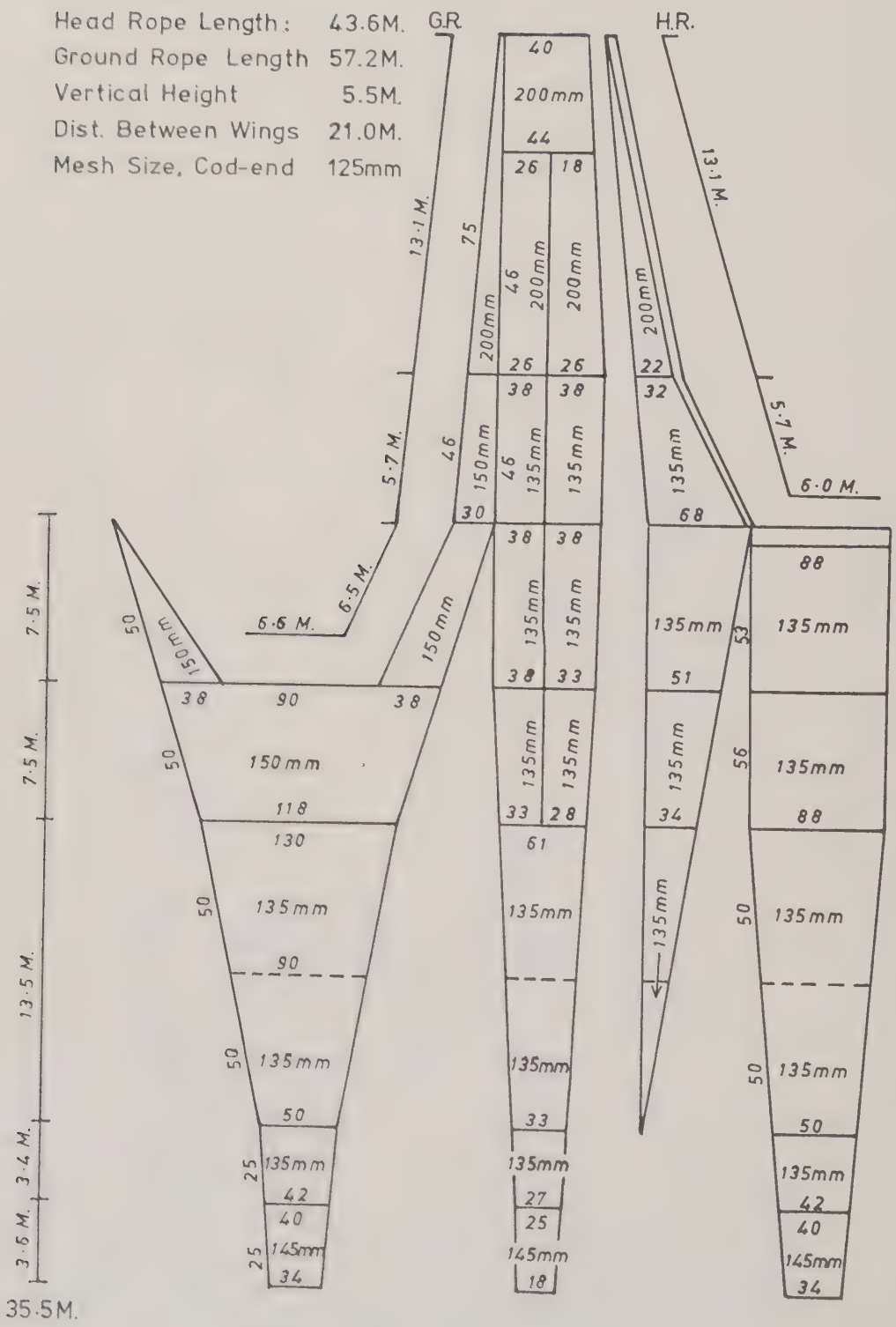


Figure 7 The design of a typical otter trawl net used by 'Taiyo Maru 71'.

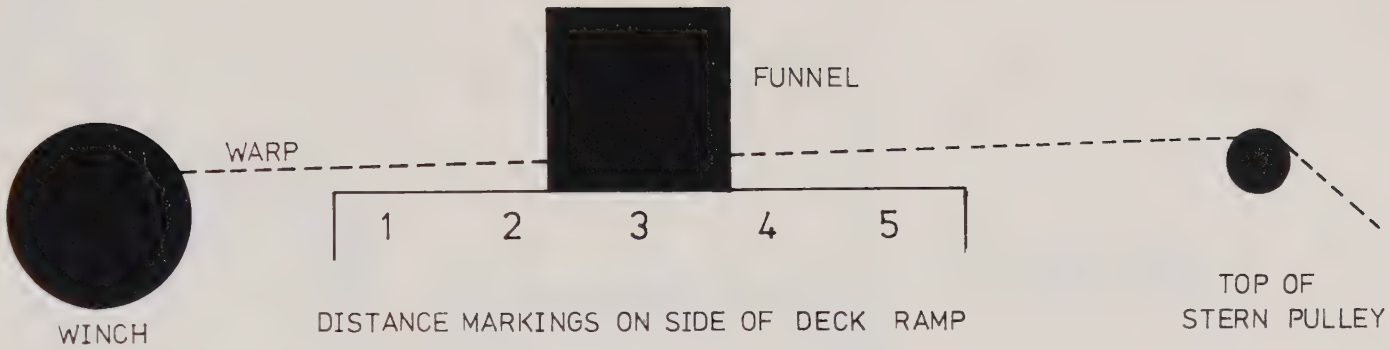
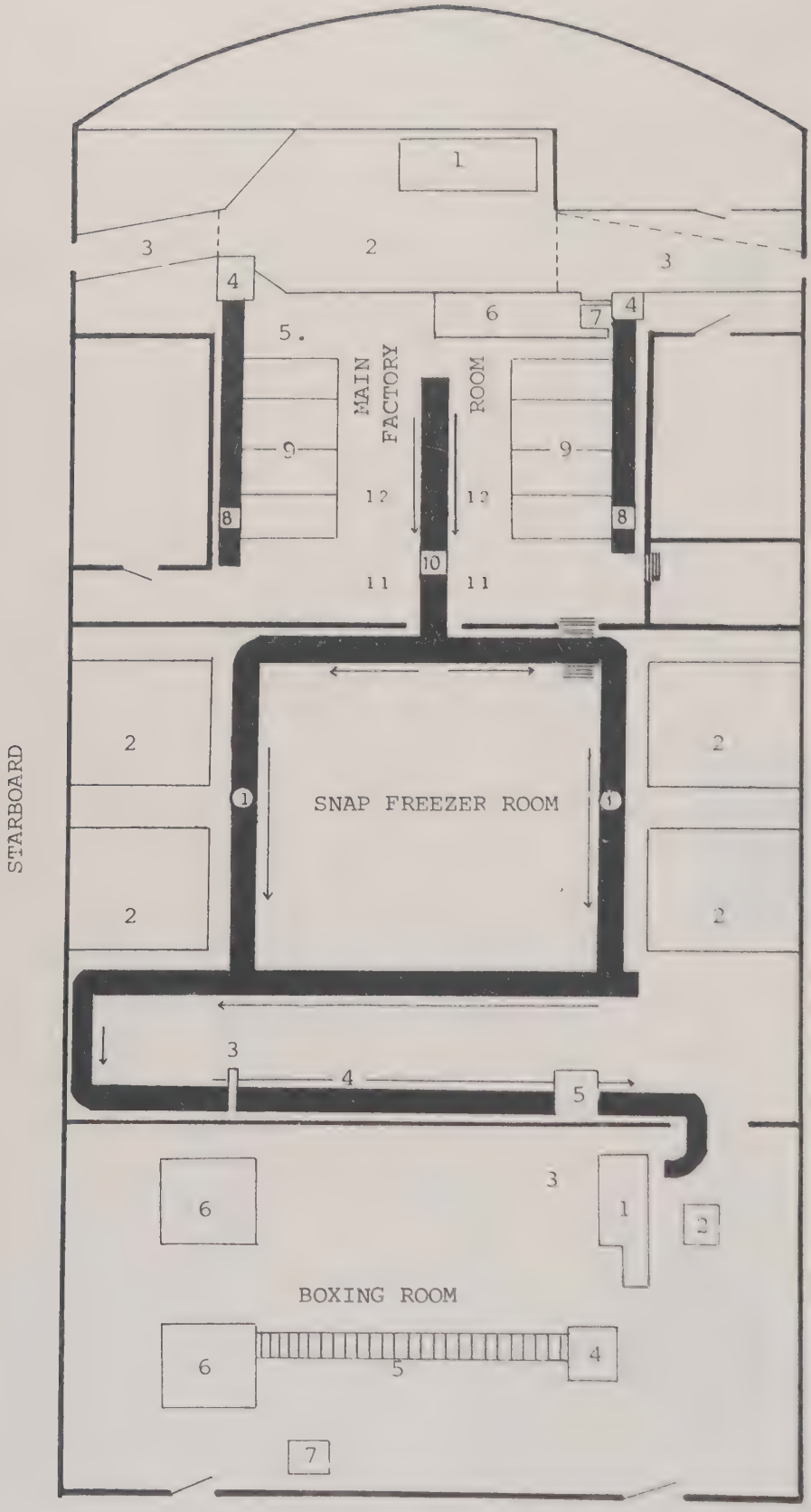


Figure 8 Marks on the deck ramp which enabled the warp: depth ratio to be more accurately set.



MAIN FACTORY ROOM

1. OVERHEAD HATCH-COVER.
2. FACTORY SORTING FLOOR.
3. TRASH CHUTES.
4. FISH WASHING MACHINES.
5. STACKING SPACE FOR BASKETS.
6. HEADING & GUTTING TABLE.
7. DOUBLE BLADE SAW.
8. CONVEYOR BELTS.
9. GRADING & PANNING TABLES.
10. CENTRAL CONVEYOR BELT.
11. SALT WATER SHOWER.
12. STACKING SPACE FOR PANS.

SNAP FREEZER ROOM

1. CONVEYOR BELTS.
2. SNAP FREEZER UNITS.
3. SALT WATER SHOWER.
4. PAN KNOCKING PLATE.
5. GLAZING MACHINE.

BOXING ROOM

1. BOXING TABLE.
2. RUBBER STAMP STAND.
3. STACKING SPACE FOR BOXES.
4. BANDING MACHINE.
5. ROLLER CONVEYOR.
6. FREEZER HOLD HATCHES.
7. STAPLE MACHINE.

Figure 9 The plan of the fish factory, freezing and boxing areas.

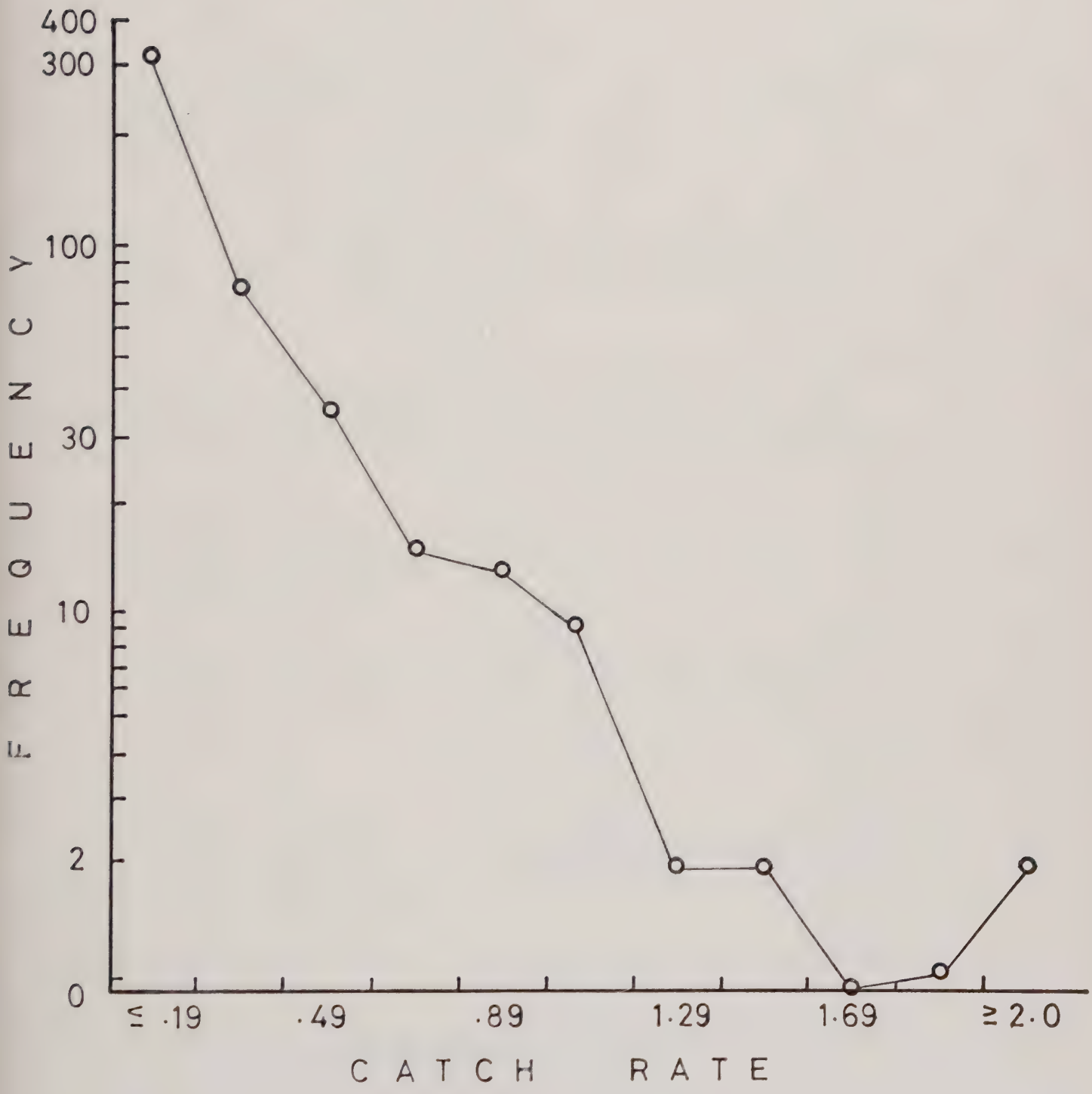


Figure 10 A frequency polygon of the distribution of catch rates (in tonne per hour), plotted on a semi-logarithmic scale

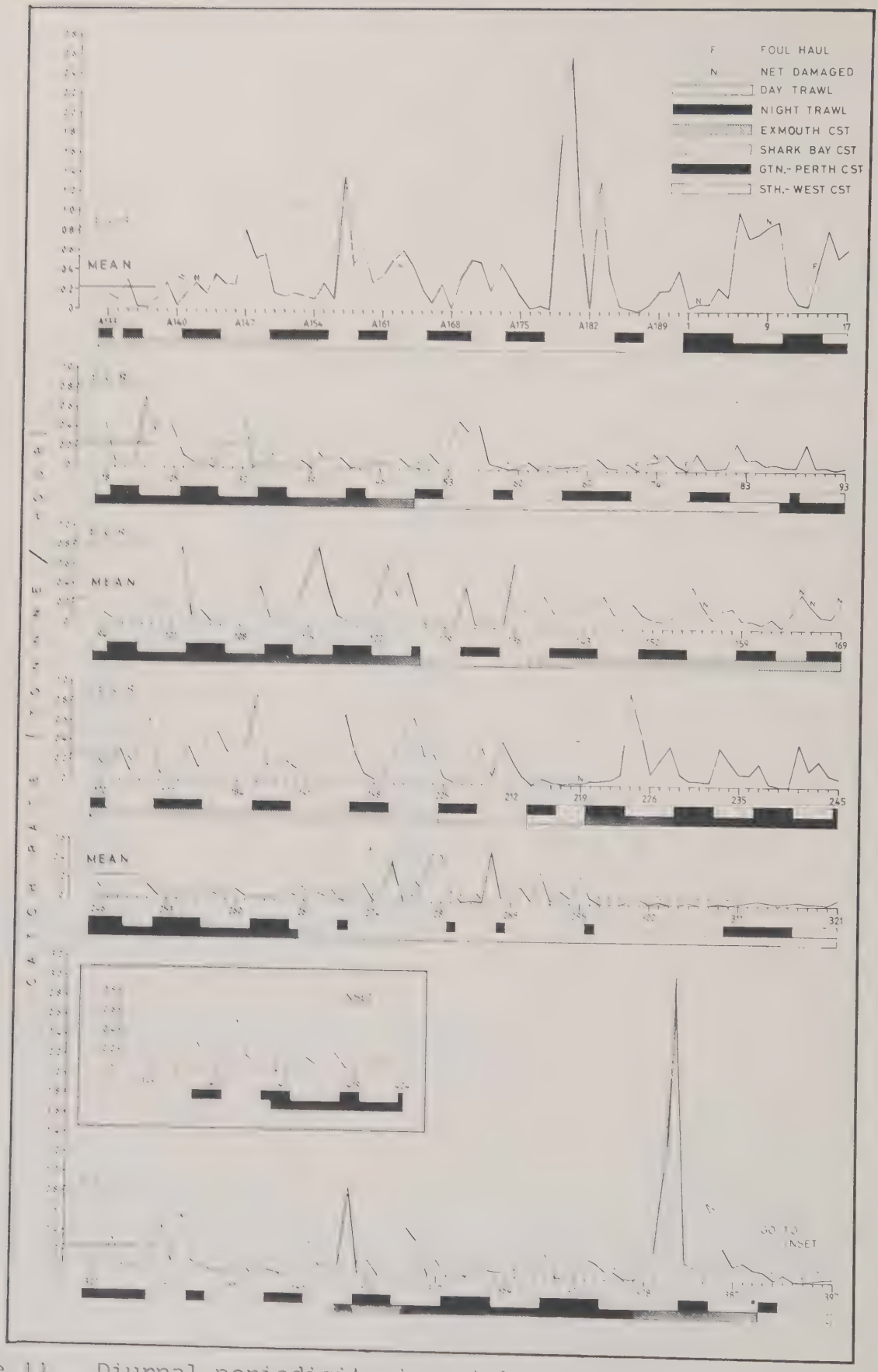


Figure 11 Diurnal periodicity in catch rates of individual trawls. The four areas in which the trawls were undertaken either in daylight hours or at night are indicated with trawl number, on the horizontal axes. The determined economic catch rate (E.C.R.) and mean catch rate for the cruise are shown on the vertical catch rate axis.

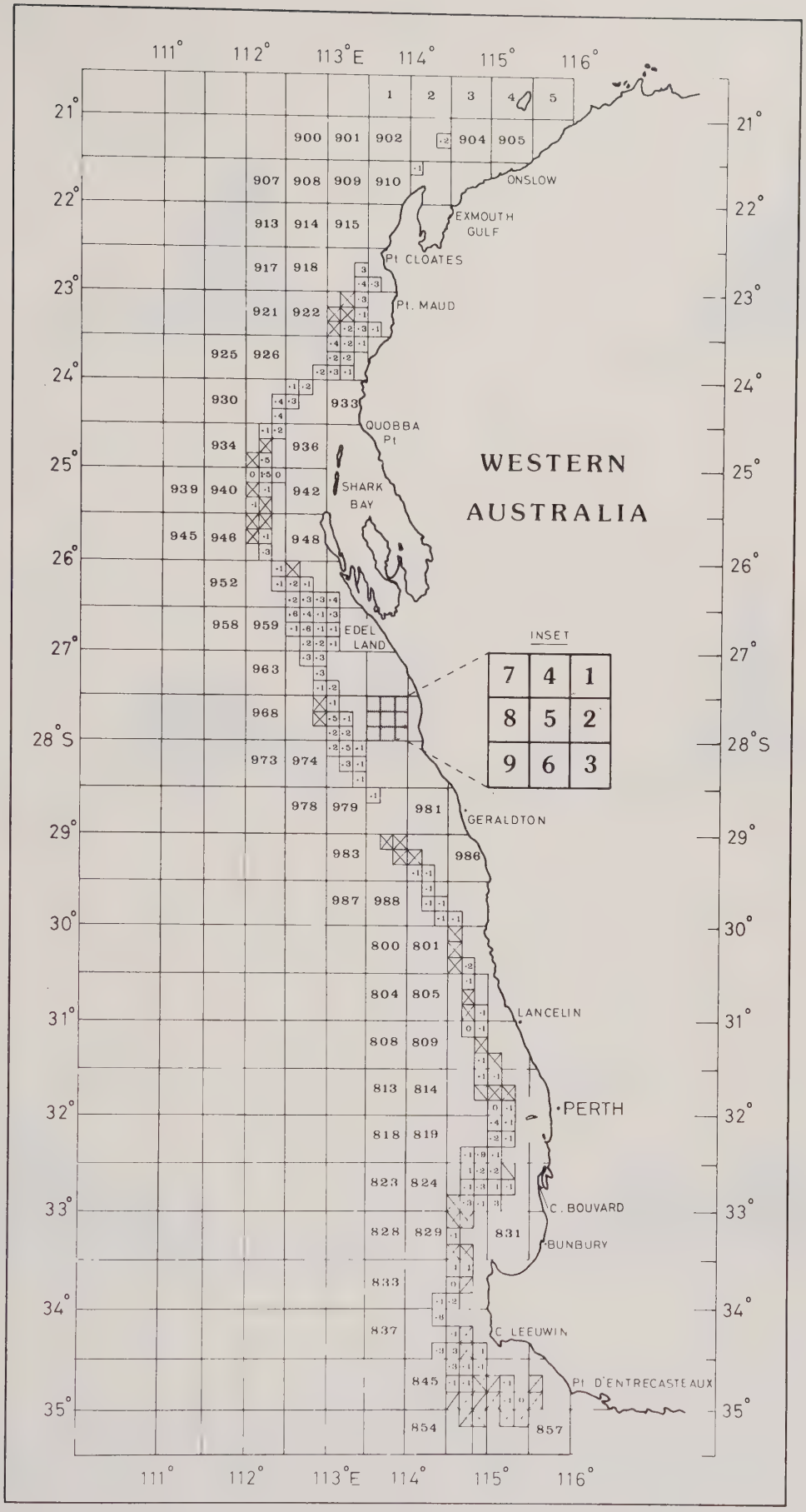


Figure 12 The mean catch per unit of effort (tonne per hour) of commercial species by sub-block. Sub-blocks with a C.P.U.E. of less than 0.1 tonne per hour are marked X.

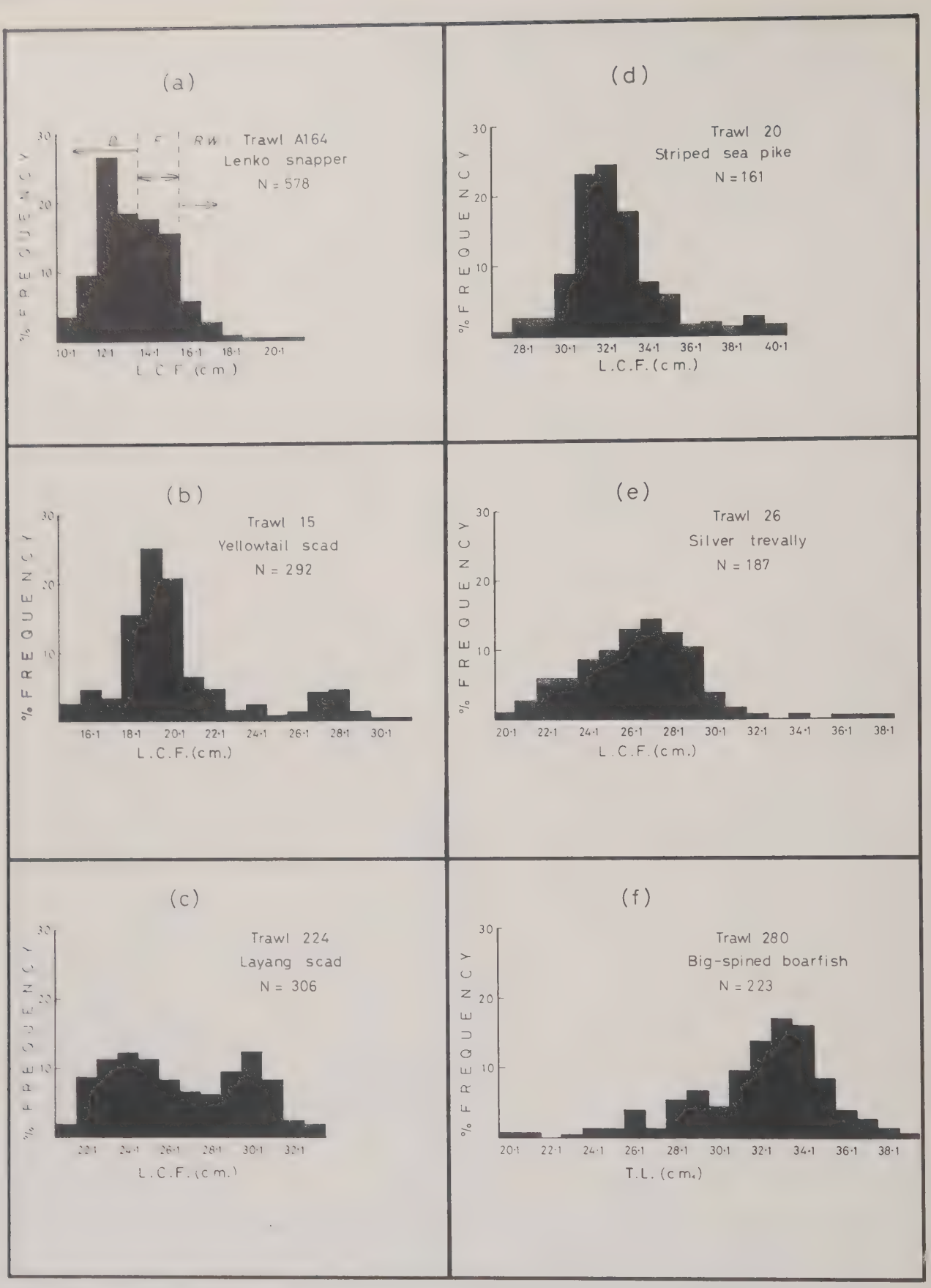


Figure 13 Length composition of 6 fish species of major importance to the Japanese from random samples. They were: (a) lenko snapper (*Taius iumifrons*) showing size range discarded (D), occasionally filleted (F) and retained whole (R.W.); (b) yellowtail scad (*Trachurus mccullochi*); (c) layang scad (*Decapterus macrosoma*); (d) striped sea pike (*Sphraena obtusata*); (e) silver trevally (*Pseudocaranx sp*); (f) big-spined boarfish (*Undecimus [illegible]*). Measurements (a)-(e) are length to caudal fork and (f) is total length.

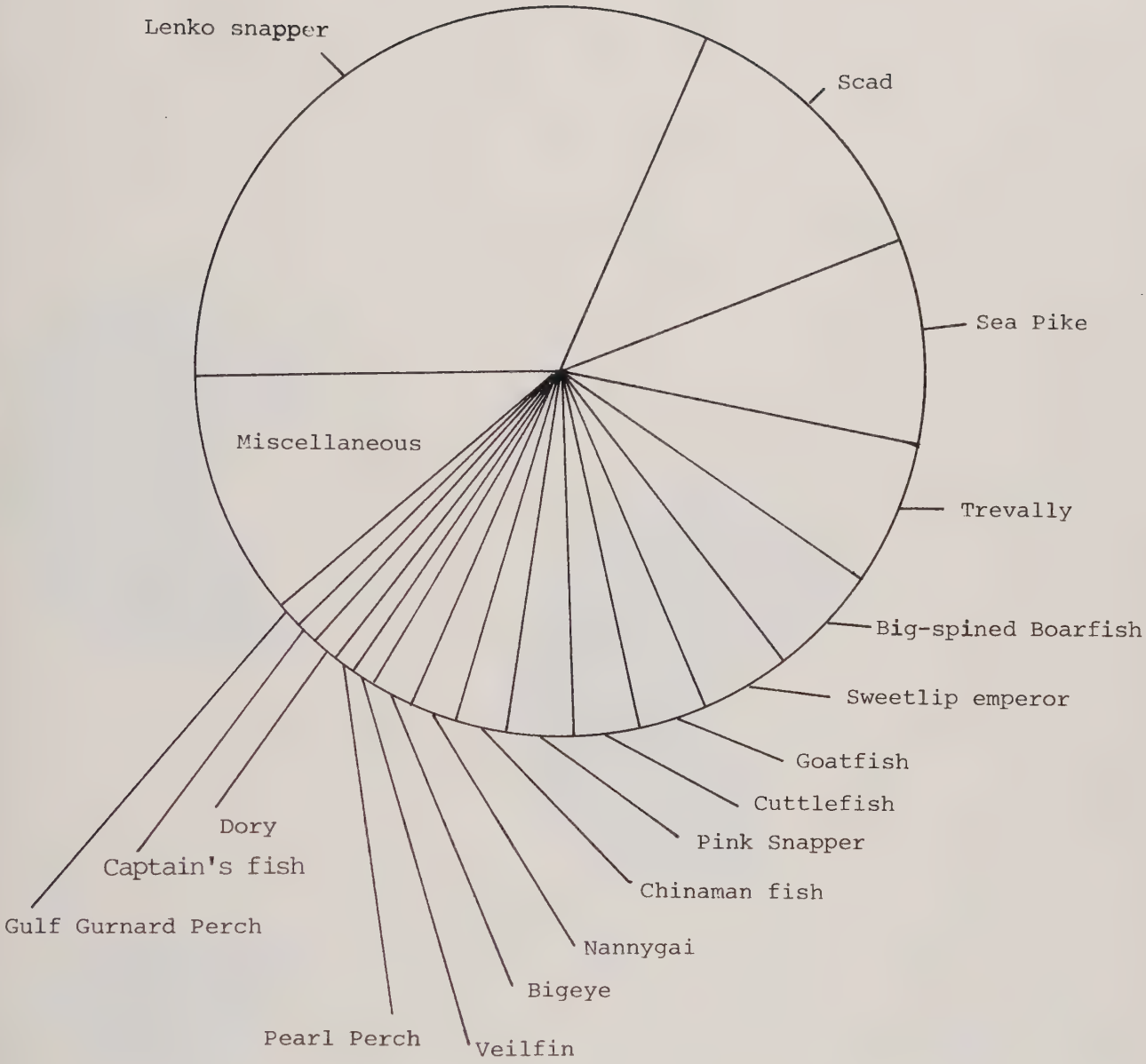


Figure 14 The composition of the saved catch by weight showing the proportions of the major and lesser species.

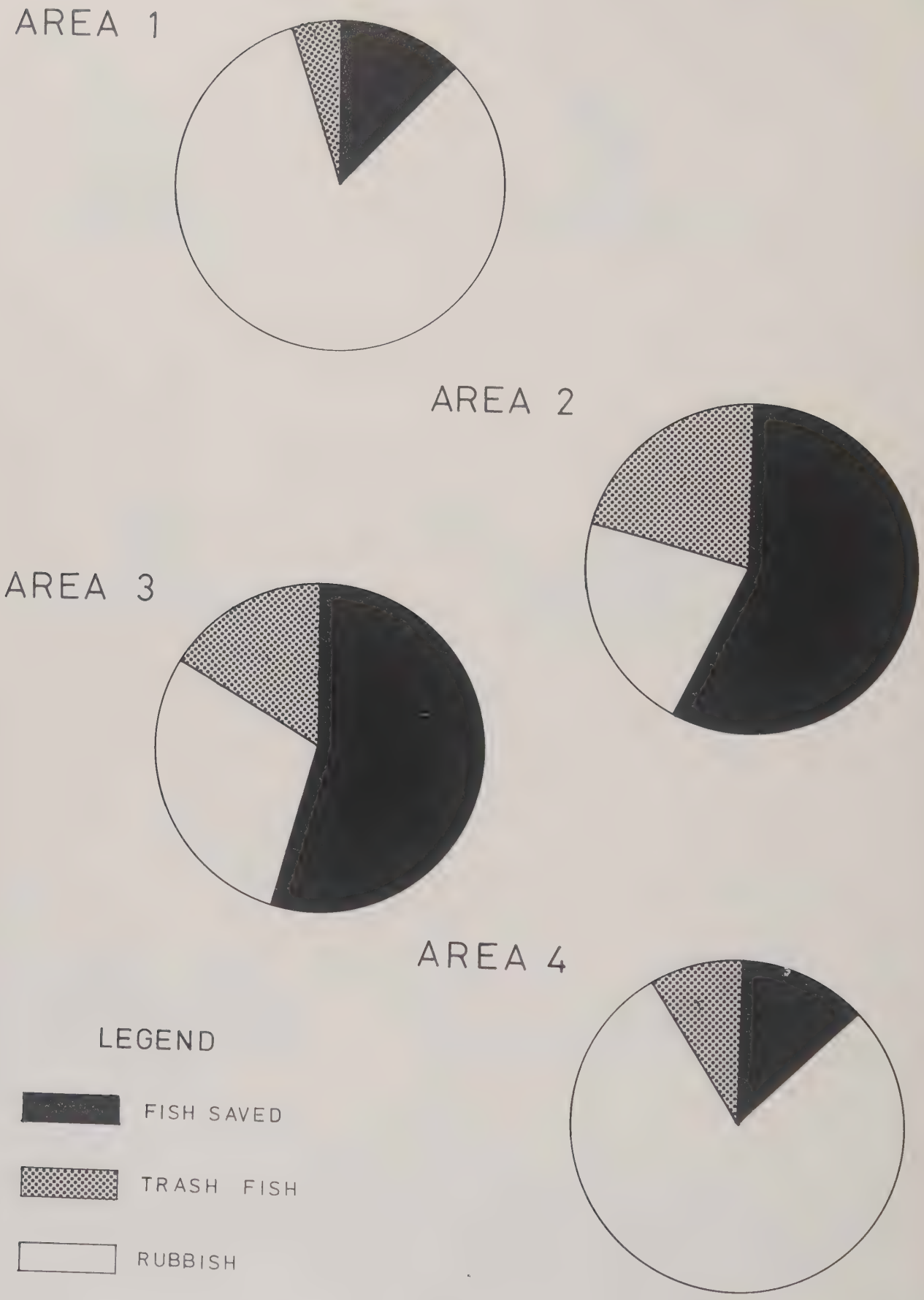
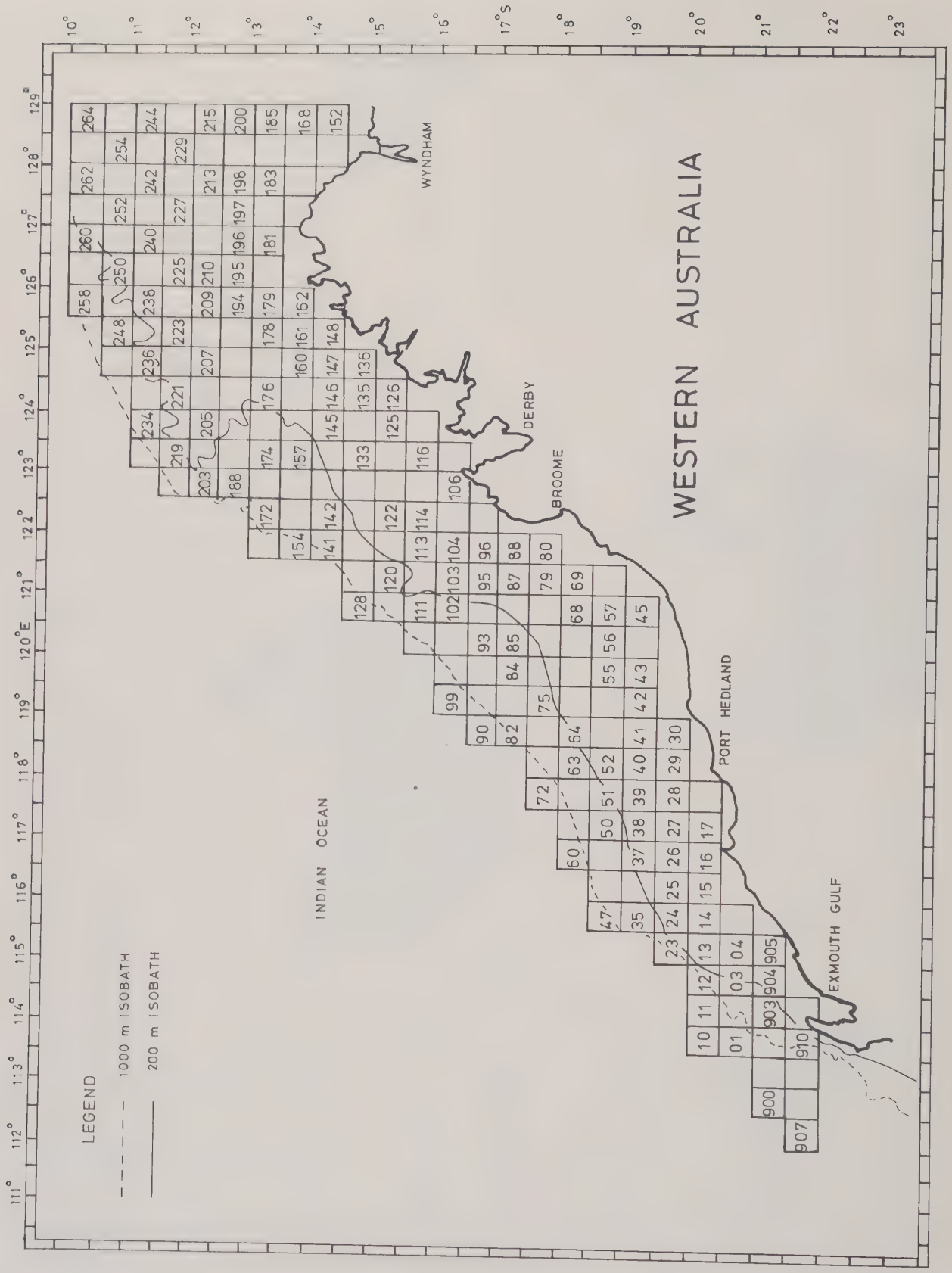


Figure 15 A comparison for fishing areas 1-4 of mean weights of fish saved, trash fish and rubbish discarded.

Appendix 1 Dates, Ports used and blocks fished by 'Taiyo Maru 71' whilst in W.A. waters in 1979. The accompanying Appendix figure shows blocks fished in northern W.A. waters during periods before and after observers were on board vessel.

TRIP NO.	DATES	PORT USED	BLOCKS FISHED, SOUTH TO NORTH										
1	10.02.79-06.04.79	PERTH	23	24	25	26	27	28	29	30	37	38	39
			40	41	42	43	50	51	52	55	56	57	63
			64	68	69	75	79	80	84	85	87	88	95
			96	102	103	104	111	113	114	120	125	126	128
			135	136	141	142	145	146	147	148	157	160	161
			162	178	179	183	194	195	196	197	198	209	210
2	09.04.79-14.05.79	GERALDTON	910	911	903	904	03	04	14	15	16	17	24
			25	26	27	28	29	39	40				
3	25.06.79-23.07.79	GERALDTON	947	941	935	931	932	927	928	923	919	911	904
			903	03	12	14	15	16	26	27	28	41	42
			43	69									
4	25.07.79-17.09.79	GERALDTON	855	856	846	847	848	838	839	834	835	830	831
			825	826	820	821	815	816	810	811	806	802	990
			989	984	985	980	975	969	970	971	964	965	960
			961	953	954	955	947	941	935	931	932	927	928
			921	923	924	919	920						
5	19.09.79-15.10.81	GERALDTON	910	911	903	904	03						



Appendix 1 figure Blocks fished in northern W.A. waters by 'Taiyo Maru 71' during periods before and after observers were on board vessel.

Appendix 2 The design of a logsheet from the Department of Primary Industry's Midwater and Bottom Trawling Research Log.

Department of Primary Industry
English (V1)

MIDWATER AND BOTTOM TRAWLING RESEARCH LOG № 0403

INTERNATIONAL RADIO CALL SIGN [ ][ ][ ][ ][ ][ ][ ] (11–18) SKIPPER..... BOAT NAME..... DATE (GMT) ...../...../..... (Day 19-20, Month 21-22, Year 23-24)

Trawl Number	Searching Time (hours)	Start Fishing: Zulu Time (GMT) (24 hr clock) Day, Time	Start Fishing: Position Degrees & Mins Lat.	Start Fishing: Position Degrees & Mins Long.	Gear Code	Trawling Speed (knots)	Average Fishing Depth (metres)	Bottom Depth During Trawl (metres) Min.	Bottom Depth During Trawl (metres) Max.	Bottom Type 1 Rock	Bottom Type 2 Coral	Bottom Type 3 Mud	Bottom Type 4 Sand	Surface Temperature °C	Net Temperature °C	Start Hauling: Zulu Time (GMT) (24 hr clock) Day, Time	Start Hauling: Position Degrees & Mins Lat.	Start Hauling: Position Degrees & Mins Long.	Estimate of Gross Haul (tonnes): Total Haul	Estimate of Gross Haul (tonnes): Rubbish Discarded	Estimate of Gross Haul (tonnes): Trash Fish Discarded	Estimate of Gross Haul (tonnes): Fish Retainable	* Net Damage
25 26 27	28-30	31-36	37-40	41-45	46	47-48	49-52	53-56	57-60					62-64	65-67	28-33	34-37	38-42	43-46	47-50	51-54	55-58	59
1 1	:	Z				.								.	.	2 Z							
1 2	:	Z				.								.	.	2 Z							
1 3	:	Z				.								.	.	2 Z							
1 4	:	Z				.								.	.	2 Z							
1 5	:	Z				.								.	.	2 Z							
1 6	:	Z				.								.	.	2 Z							
1 7	:	Z				.								.	.	2 Z							
1 8	:	Z				.								.	.	2 Z							
1 9	:	Z				.								.	.	2 Z							
1 10	:	Z				.								.	.	2 Z							
1 11	:	Z				.								.	.	2 Z							
1 12	:	Z				.								.	.	2 Z							
1 13	:	Z				.								.	.	2 Z							
1 14	:	Z				.								.	.	2 Z							
1 15	:	Z				.								.	.	2 Z							
1 16	:	Z				.								.	.	2 Z							
1 17	:	Z				.								.	.	2 Z							
1 18	:	Z				.								.	.	2 Z							
1 19	:	Z				.								.	.	2 Z							
1 20	:	Z				.								.	.	2 Z							

60 If not fishing is it because: (Indicate – ✓)

☐ Bad Weather; ☐ In port; ☐ Breakdown; ☐ Steaming to or from grounds; ☐ Other (Specify in comments)

Comments: .....
(If necessary indicate to which trawl comments apply)

* To be inserted as:
1. Lost
2. Damaged & discarded
3. Wing damage
4. Body damage
5. Cod end damage

CATCH DETAILS

– Indicate units used (e.g. kg, weight of trays)

Trawl Number	3									4									Total weight of catch retained (kg)
26 27	28-32	33-37	38-42	43-47	48-52	53-57	58-62	63-67	68-72	28-32	33-37	38-42	43-47	48-52	53-57	58-62	63-67	68-72	
1																			
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Appendix 3 Catch rates (in tonne per hour) of the 16 trawl shots with commercial potential showing dominant species, related by date and latitude.

Date	Shot No.	Range Latitude	Area	Catch Rate	Comment
16/7	A157	24°17' - 24°24'	2	1.370	LENKO Dominant 1
19/7	A179	24°56' - 25°05'	2	1.788	LENKO Dominant 1
19/7	A180	25°03' - 24°54'	2	2.574	LENKO Dominant 1
19/7	A181	24°55' - 25°08'	2	0.889	LENKO Dominant 1
20/7	A183	25°08' - 24°58'	2	1.316	LENKO Dominant
8/8	116	26°46' - 26°39'	3	0.814	LENKO Dominant
27/7	15	27°15' - 27°09'	3	0.830	SCAD* Dominant
21/8	224	26°27' - 26°22'	3	0.951	SCAD* Dominant
10/9	380	27°50' - 27°45'	3	1.106	SCAD* Dominant
10/9	381	27°43' - 27°37'	3	3.109	SCAD* Dominant
26/7	6	28°08' - 28°04'	3	1.181	SEA PIKE* Dominant 68%
26/7	9	28°06' - 28°11'	3	0.865	SEA PIKE* Dominant 100%
26/7	10	28°09' - 28°03'	3	0.924	SEA PIKE* Dominant 98%
15/7	A147	23°52' - 23°58'	1	0.814	TREVALLY* Dominant 71%
6/9	348	32°25' - 32°21'	3	0.884	B/S BOARFISH Dominant 90%
16/8	186	23°05' - 22°58'	1	0.908	BIG EYE Dominant 48%

* Pelagic species.

Appendix 4

The first analysis of variance undertaken on mean catch rates for each area demonstrated an overall significant difference ($p<0.01$ table not shown). Although area had a significant effect on the variation, it accounted for only 4% of the total sum of squares. Therefore it was thought that other factors not considered may have been responsible for some of the remaining variation. Hence the data were re-examined with a two-factor analysis of variance. It was then found that both area and day or night had a significant effect on the variation ($p < 0.04$) but nevertheless only 11% of the total sum of squares was explained by these 2 main effects (see (a) below).

(a)

SOURCE OF VARIATION	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F	SIGNIFICANCE OF F
MAIN EFFECTS	4.21	4	1.05	14.48	0.001
Area	1.87	3	0.62	8.58	0.001
Day/night	2.68	1	2.68	36.82	0.001
INTERACTION					
Area with Day/night	0.60	3	0.20	2.73	0.044
EXPLAINED	4.80	7	0.69	9.44	0.001
RESIDUALS	33.95	467	0.07		
TOTAL	38.75	474	0.08		

Proportion of sum of squares explained = 0.12

As day catch rates were generally much greater than those at night (Figure 11), a further analysis of variance was carried out on them to determine the proportion of the variation due to the effects of area and depth (see (b) below).

(b)

SOURCE OF VARIATION	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F	SIGNIFICANCE OF F
MAIN EFFECTS					
Area	2.21	3	0.71	6.45	<0.001
Depth	2.80	18	0.18	1.60	0.070
INTERACTION					
Area with depth	3.63	33	0.11	1.01	0.465
RESIDUALS	24.94	228	0.11		

Once again area had a highly significant effect on the variation ($p < 0.001$) but neither depth alone nor the interaction of area with depth was significant in the analysis of variance.

APPENDIX 5 List of commercially important fish species taken during the cruise by family, scientific, common and Japanese name.

FAMILY	JAPANESE	SPECIES	COMMON NAME
TRIAKIDAE	ホシフカ	*Mustelus antarcticus* Gunther, 1870	Gummy shark
CARCHARHINIDAE	フカ	*Carcharhinus albimus* (Springer, 1950)	Bignose shark
SQUALIDAE	ツマリツノザメ	*Squalus megalops* (Macleay, 1882)	Piked dogfish
CHIMAERIDAE	ギンフカ	*Hydrolagus ogilbyi* (Waite, 1898)	Ghostfish or Spookfish
SYNODONTIDAE	マエソ	*Saurida undosquamis* (Richardson, 1848)	Lizard Fish
BERYCIDAE	キンメ キンメ	*Centroberyx affinis* (Gunther, 1859) *Beryx* sp.	Nannygai Alfonsin
ZEIDAE	白マト マトダイ マトダイ	*Zenopsis nebulosus* (Temminck & Schegel, 1845) *Zeus faber* Linnaeus, 1758 *Cyttoidops mccullochi* (Whitley, 1947)	Mirror dory John dory McCulloch's dory
VELIFERIDAE	トゲマト	*Metavelifer multiradiatus* Regan, 1907	Veilfin
SCORPAENIDAE	アラカブ アラカブ	*Neosebastes panticus* McCulloch & Waite, 1918 *Neosebastes pandus* (Richardson, 1842)	Gulf gurnard perch Gurnard perch
TRIGLIDAE	ホボ ホタ	*Pterygotrigla polyommata* (Richardson, 1839) *Chelidonichthys kumu* (Lesson & Garnot, 1826)	Latchet Red gurnard
PLATYCEPHALIDAE	メコム コム	*Platycephalus longispinus* (Macleay, 1884) *Neoplatycephalus speculator* Kunzinger, 1872	Deepwater flathead Sand flathead
SERRANIDAE	糸エイサキ アラ	*Anthias pulchellus* Waite, 1899 *Epinephelus* spp.	Captain's fish Rock cod
GLAUCOSOMIDAE	ギンタイ 銀タイ	*Glaucosoma burgeri* Richardson, 1844 *Glaucosoma hebraicum* Richardson, 1844-8	Pearl perch Westralian jewfish
PRIACANTHIDAE	アカメ アカメ	*Pricanthus macracanthus* Cuvier, 1829 *Cookeolus boops* (Bloch & Schneider, 1801)	Red bullseye Threadfin bullseye

APPENDIX 5 (continued)

FAMILY	JAPANESE	SPECIES	COMMON NAME
POMATOMIDAE	サケ	*Pomatomus saltator* Linnaeus, 1758	Tailor
CARANGIDAE	ヒラアジ	*Pseudocaranx dentex* (Bloch & Schneider, 1801)	Trevally
	カイワリ	*Carangoides equula* Temminck & Schlegel, 1842	White-finned cavalla
	アカバナ	*Seriola dumerilii* Temminck & Schlegel, 1844	Amberjack
	アジ	*Trachurus mccullochi* Nichols, 1920	Yellowtail scad
	アジ	*Decapterus maruadsi* Temminck & Schlegel, 1842	Round scad
	アジ	*Decapterus macrosoma* Bleeker, 1851	Layang scad
	スギ	*Seriolina nigrofasciata* (Rupell, 1828)	Black banded kingfish
	マアジ	*Trachurus declivis* (Jenyns, 1841)	Jack mackerel
LUTJANIDAE	ナガダイ	*Symphorus nematophorus* (Bleeker, 1860)	Chinaman fish
	センネンダイ	*Lutjanus sebae* (Cuvier, 1828)	Red emperor
	クラカケタルミ	*L. malabricus* (Bloch & Schneider, 1801)	Scarlet sea perch
	キビレフエダイ	*Lipocheilus carnolabrum* Chan, 1970	Fleshy lipped snapper
	オオヒメ	*Pristipomoides filamentosus* (Valenciennes, 1830)	Rosy jobfish
	ベラヒメイ	*P. typus* Bleeker, 1852	Sharptoothed snapper
	ナガサキフエダイ	*P. multidens* (Day, 1870)	Goldband snapper
NEMIPTERIDAE	ソコイトヨリ	*Nemipterus bathybus* Snyder, 1911	Yellow lined threadfin bream
	モモイトヨリ	*Nemipterus peroni* (Valenciennes, 1830)	Peron's threadfin bream
POMADASYIDAE	コロダイ	*Plectorhynchus pictus* (Thunberg, 1792)	Slate bream or Sweetlip
	ツマセイダイ	*Hapalogenys kishinouyei* Smith & Pope, 1906	Brown lined sweetlip
LETHRINIDAE	フエフキ	*Lethrinus chrysostomus* Richardson, 1844-8	Sweetlip emperor
	キイロフエフキ	*Lethrinus nebulosus* (Forskal, 1775)	Yellow sweetlip emperor
	フエフキ	*Lethrinus choerorynchus* Schneider, 1801	Emperor
GYMNOCRANIDAE	サザナミガイ	*Gymnocranius robinsoni* (Gilchrist & Thompson 1908)	Sea bream
	メイチダイ	*Gymnocranius griseus* (Temminck & Schegel, 1843)	Collared sea bream
SPARIDAE	レンコ	*Taius tumifrons* (Temminck & Schegel, 1842)	Lenko snapper
	マダイ	*Chrysophrys unicolor* Quoy & Gaimard, 1824	Pink snapper
	タイワンダイ	*Argyrops spinifer* (Forsskal, 1775)	False snapper
SCIAENIDAE	イシモチ	*Argyrosomus hololepidotus* (Lacepede, 1802)	Mulloway

APPENDIX 5 (continued)

FAMILY	JAPANESE	SPECIES	COMMON NAME
MULLIDAE	ヒメジ	*Parupeneus* sp.	Surmuletes goatfish
	キンセンヒメジ	[illegible] Klunzinger, 1855	Lemon stripe goatfish
	クロクラカケヒメジ	[illegible] (Valenciennes, 1831)	Red spotted goatfish
	アカヒメジ	*Upeneichthys lineatus* (Bloch & Schneider, 1801)	Red mullet
[illegible]	プチツボダイ	[illegible] Whitley, 1945	Spotted boarfish
	ツボダイ	*[illegible]cimus hendecacanthus* (McCulloch, 1915)	Big-spined boarfish
[illegible]	イシダイ	[illegible] Waite, 1900	Kalifejaw
CHEILODACTYLIDAE	ツマダイ	*Nemadactylus valenciennesi* (Whitley, 1937)	Queen snapper
		Dactylophora nigricans (Richardson, 1850)	Dusky morwong
[illegible]	カマス	[illegible] Cuvier, 1829	Striped sea pike
[illegible]	カンカマス	*Rexea solandri* (Cuvier & Valenciennes, 1832)	Gemfish, Hake
	オーストラリア	[illegible] (Bloch & Schneider, 1791)	Barracouta
TRICHIURIDAE	タチ	*Trichiurus coxii* Ramsay & Ogilby, 1887	Australian hairtail
SCOMBRIDAE	サバ	*Scomber australasicus* Cuvier & Valenciennes 1832	Blue mackerel
	サワラ	*Scomberomorus munroi* Collette & Russo, 1980	Spotted mackerel
		S. queensland[illegible] (Munro, 1943)	Queensland school mackerel
CEPHALOPODA	コイカ	*Sepia* spp.	Cuttlefish
	マツイカ	*[illegible] ehrenbergi* (Ball, 1841)	Orange arrow squid
	ヤツイカ	*Nototodarus sloanii gouldi* (McCoy, 1888)	Maroon arrow squid
	ホイカ	*Sepioteuthis lessoniana* (Quoy & Gaimard, 1833)	Round fin squid

* = Deepwater boarfish, Table 4.

APPENDIX 6 Common names of fish used in the Commonwealth Department of Primary Industry Logbook reconciled with common names assigned by observers.

LOGBOOK NAME	SPECIES OR COMBINATION	TRAWL SHOTS ON WHICH IDENTIFICATION WAS CONFIRMED
Pearl perch	Pearl perch	A135, A136, A139, A140, A141, A144, A145-148 A153-155, A189, A190.
	Westralian jewfish	275
Cod	Grey banded cod	3,
	Yellow spotted cod	172
Shark	Gummy shark	11, 135, 378
Scad	(a) Yellowtail scad	224, 225, 228, 260, 272, 276, 380, 381
	(b) Round scad	18, 102, 139, 143, 156, 172
	(c) Layang scad	224, 225, 228, 233, 237, 238, 415
	(d) Jack mackerel	263, 264, 317, 328, 337, 344, 345, 350
	(a) + (b)	104, 110
	(a) + (c)	213
Dory	(e) John	see mixed fish, end of table
	(f) Mirror	47, 250, 328, 331
	(g) McCulloch's	292
	(h) Reticulated	always mixed with mirror dory
	(e) + (f)	389
	(f) + (g)	287, 288, 291
	(f) + (h)	395
Nannygai	Bight red fish	60, 66, 67, 68.
	Red bigeye	2
	Red gurnard	18
	Alfonsin	291
	Nannygai + Swallowtail	54
Goatfish	Red mullet	48
	5-lined red mullet	see mixed fish, end of table

APPENDIX 6 (continued)

LOGBOOK NAME	SPECIES OR COMBINATION	TRAWL SHOTS ON WHICH IDENTIFICATION WAS CONFIRMED
Goatfish (cont'd)	(i) Sunrise	99, 101, 116, 151, 172, 386
	(j) Saddle	143, 156
	Lemon stripe	157, 174, 183
	(i) + (j)	172, 176
Bigeye	Nannygai	131
	(k) Red	166, 183, 195, 237
	(l) Threadfin	386, 397
	(m) Orange banded	mixed with red bigeye
	(k) + (m)	174
Trevally	White finned cavalla	147, 148, 378, 379, 403, 407
	Skipjack Trevally and/or Silver Trevally	165, 171-172, 191-195, 197, 201-204, 228, 235, 263, 268, 413, 417.
Latchet	Latchet + Red gurnard	317, 318, 321, 324, 339, 344-346, 363, 366.
Sweetlip emperor	(n) Yellow sweetlip	always mixed
	(o) Sweetlip emperor	195
	(p) Sea bream	always mixed
	(n) + (o)	157, 194
	(o) + (P)	158, 171, 174, 186
Deepwater boarfish	(q) Big-spined boarfish	279
	(r) Different giant boarfish	always mixed with deepwater boarfish
	(q) + (r)	280

Mixed fish entries: 1. Tailor 2. Black banded kingfish 3. Scarlet sea perch 4. Batfish 5. Slate bream 6. Silver trevally 8. Red saddle pigfish 9. Black spot pigfish 10. Sea bream 11. Chinaman fish 12. Veilfin 13. 5-lined red mullet 14. Deepwater flathead 15. Gulf gurnard perch 16. Spotted boarfish 17. Sand flathead 18. Mirror dory 19. Blue mackerel 20. Amberjack 21. Northern scad 22. Golden lutjanid 23. Grey banded cod 24. Knifejaw 25. Latchet 26. John dory 27. Layang scad 28. Sweetlip emperor 29. Big-spined boarfish 30. Barracouta

Shot numbers on which mixed fish combinations (in brackets) identified dressed (D) or whole (R):

Shot 58D (14) Shot 87D (14, 16, 24, 25) Shot 100D (6,16) Shot 117D (26) Shot 128D (12, 27) Shot 129R (6) Shot 142D (10, 28) Shot 151D (1) Shot 157D (2) Shot 172D (3, 4, 5, 6) Shot 174D (8,9) Shot 235D (10, 11, 12) Shot 254D (14) Shot 259D (13) Shot 263D (14, 15) Shot 270D (14) Shot 287D (14) Shot 331D (14) Shot 336D (14, 16, 17) Shot 340D (18, 29) Shot 344D (19) Shot 348D (30) Shot 367D (16) Shot 368D (16, 20) Shot 375D (6, 21) Shot 406D (22) Shot 410D (22, mixed fish) Shot 418D (16, 23)

PLATE 1

'Taiyo Maru 71' steaming into Geraldton, W.A.

PLATE 2

Stern view of 'Taiyo Maru 71' refuelling.

PLATE 3

Bow view of 'Taiyo Maru 71' showing bridge and super-structure.

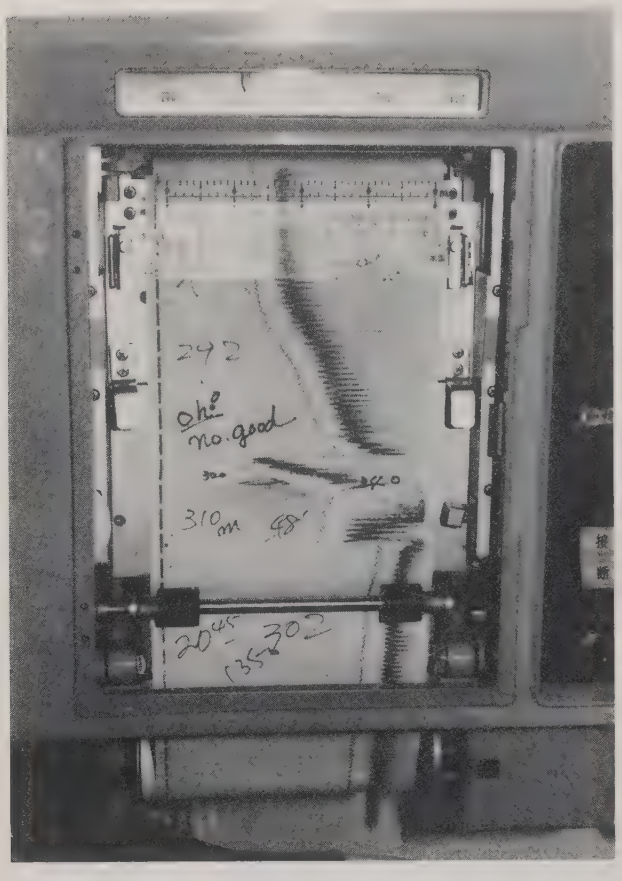

PLATE 4

The Furuno echo sounder in chart room, showing 40 m bottom chasm.

PLATE 5

Codend of net pulled out by stern gantry line prior to shooting away

PLATE 6

Codend is winched above hatch leading to fish factory sorting floor.

PLATE 7

Crewmen repairing net prior to changing nets.

PLATE 8

Cleared sorting floor in fish factory.

PLATE 9

Fish baskets stacked before use, near starboard fish sorting bays which are fed by conveyor belts behind.

PLATE 10

Fish on heading and gutting table near heading machine.

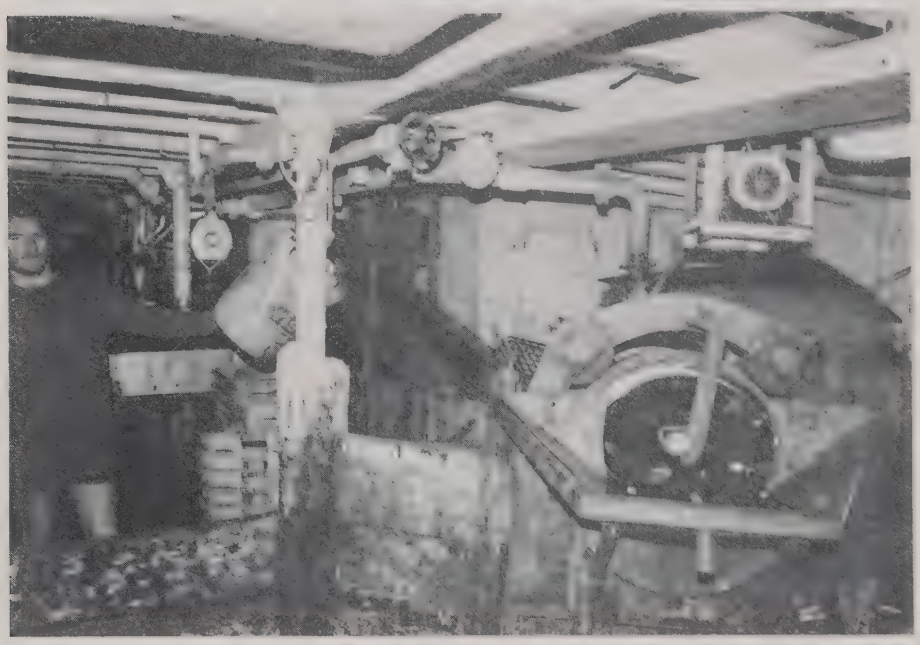

PLATE 11

Starboard washing machine and scupper boards surrounding fish factory sorting floor.

PLATE 12

Squid sorting bay (foreground). 11 kg metal pans stacked in aisle ready for use.

PLATE 13

The snap freezer room.

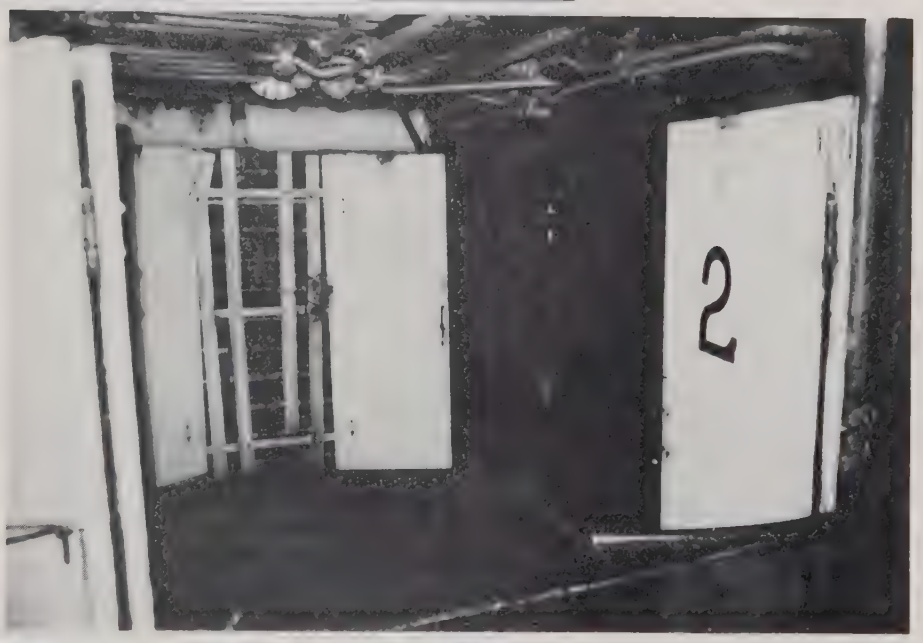

PLATE 14

Snap freezer No. 2, showing hydraulic shelving. Conveyor belt is in right foreground.

PLATE 15

A salt water shower (assembly of pipes above right, not operating) which facilitates removal of frozen blocks from the pans.

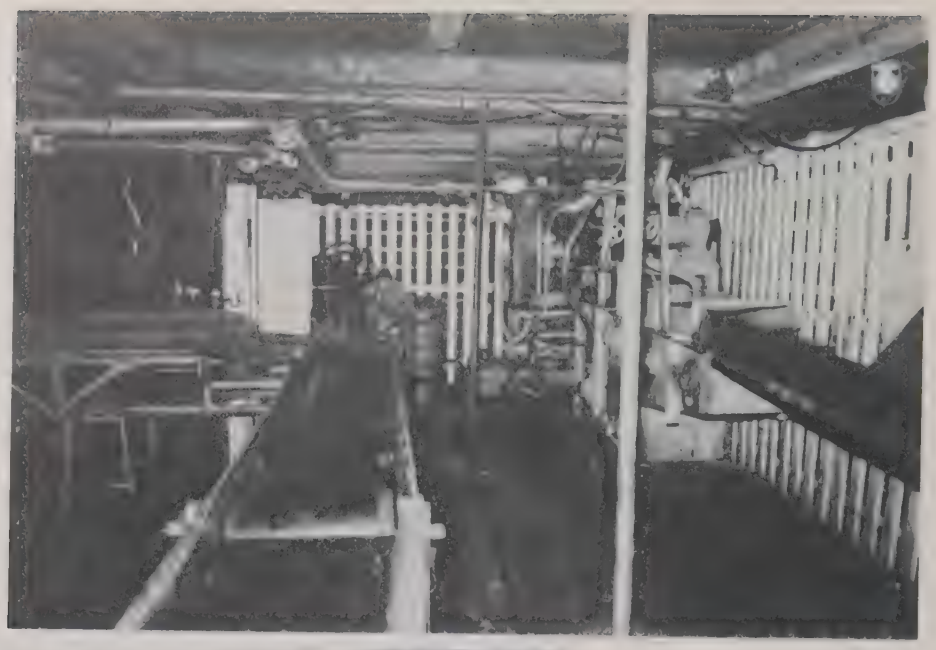

PLATE 16

The fresh-water glazing machine (pale blue assembly, background at right).

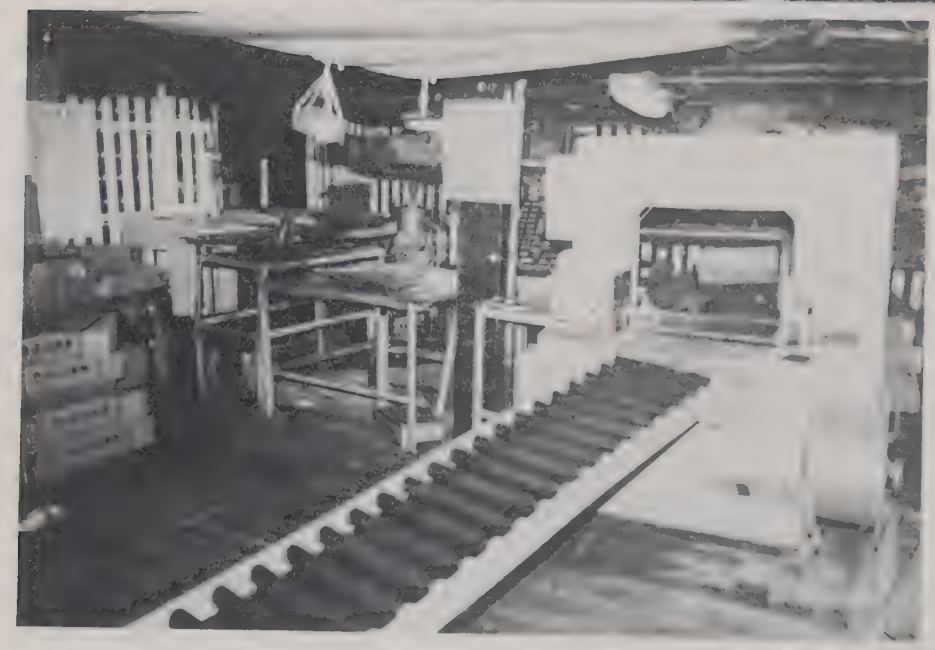

PLATE 17

The boxing, grade stamping and banding room showing roller ramp which led to hatch of freezer hold.

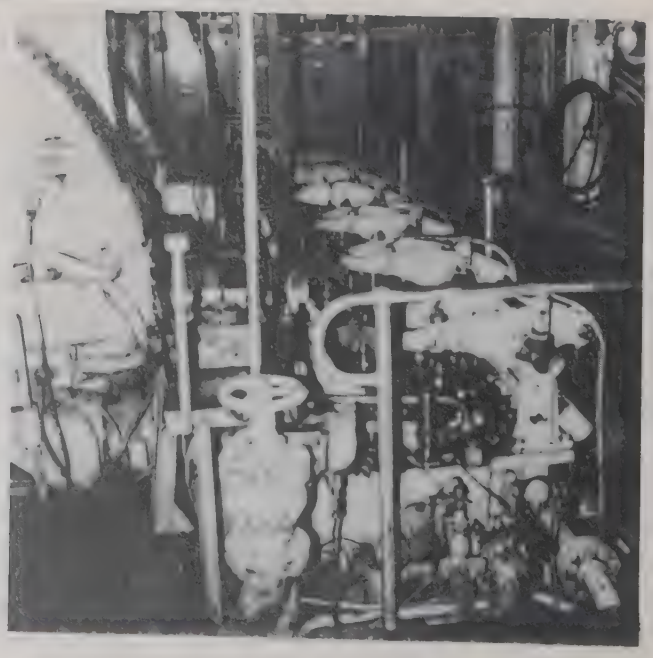

PLATE 18

View of tappets on 2000 HP main engine.

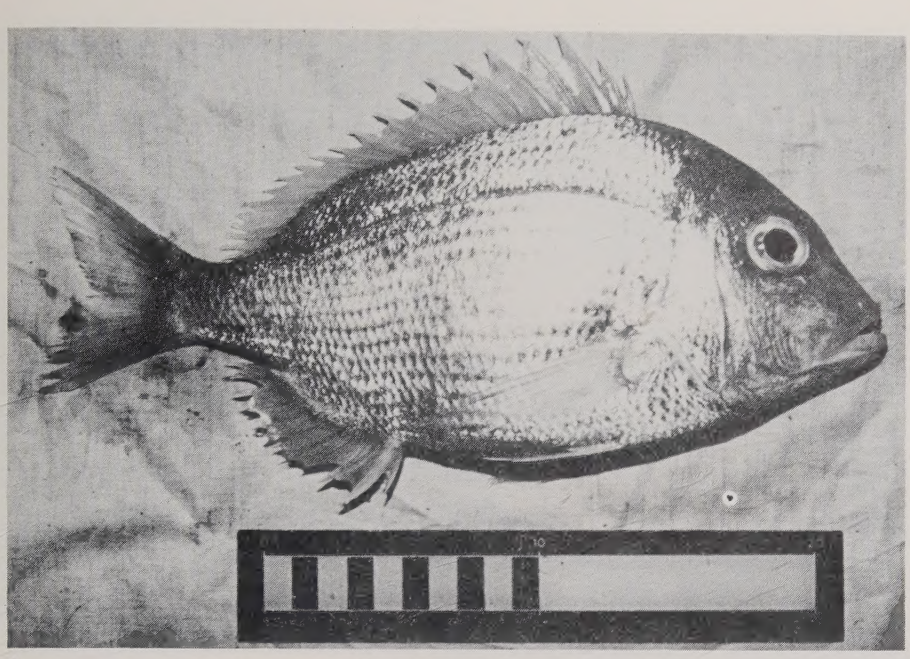

PLATE 19

Lenko snapper *(Taius tumifrons)*.

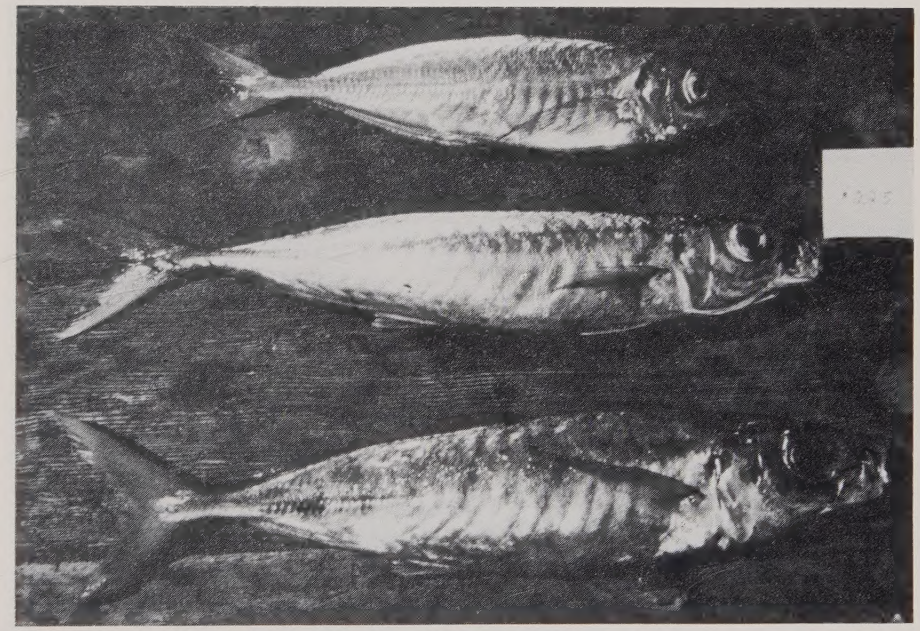

PLATE 20

Yellowtail scad *(Trachurus mccullochi)* above, round scad *(Decapterus maruadsi)* centre and layang scad *(Decapterus macrosoma)* below.

PLATE 21

Stiped sea pike *(Sphraena obtusata)*.

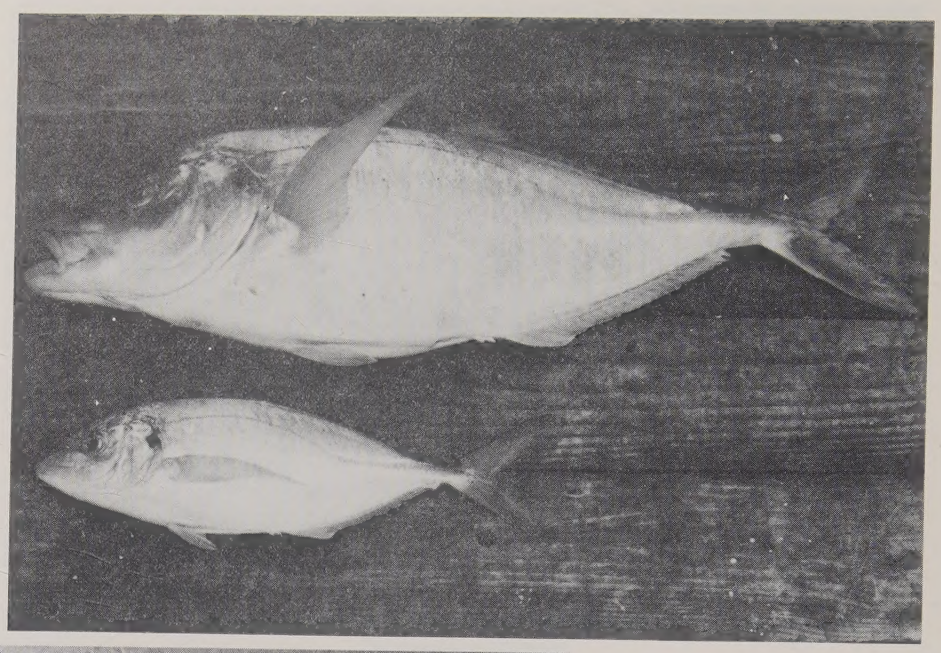

PLATE 22

Skipjack trevally (*Pseudocaranx* sp.).

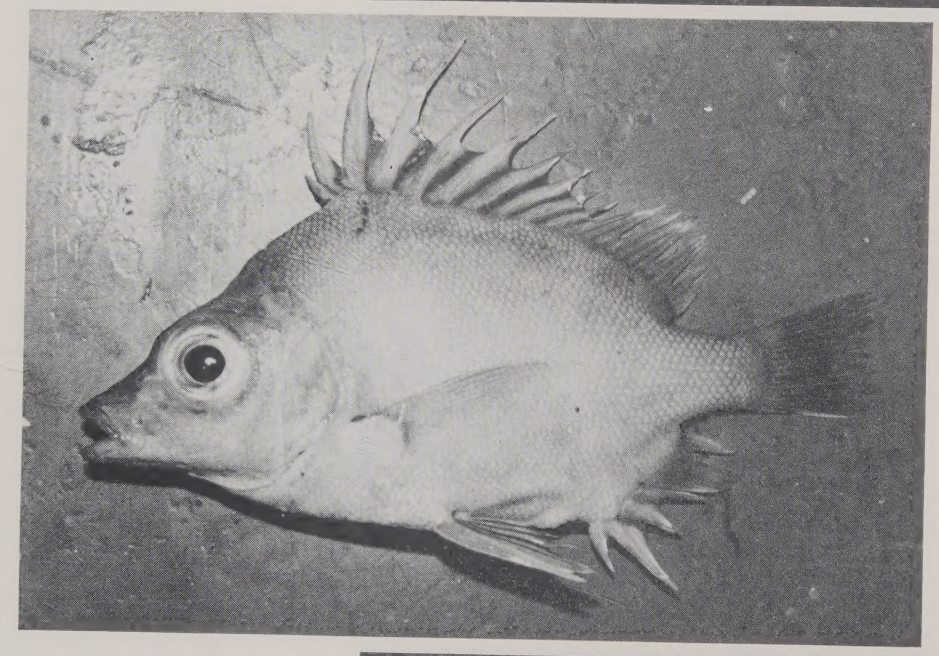

PLATE 23

Big-spined boarfish (*Undecimus hendecacanthus*).

PLATE 24

The sweetlip emperor (*Lethrinus chrysostomus*).

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